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EDITORIAL NOTES.

Heavier Traffic Charges.

BEING large patrons of railway companies and shippers, not only for coal but for many other classes of goods conveyed to and from gas-works, the conductors of gas undertakings and other businesses associated with the industry are deeply concerned in matters that affect transport. For some time past, the companies down south whose coal is sea borne have had to pay more dearly for transport; and gas undertakings almost everywhere that are dependent upon the railways have found cause for complaint over their inadequacy and inefficiency for dealing with goods traffic. The railway companies have accused the traders of being partially to blame for this, owing to their want of consideration in the matter of the retention of trucks. But there is not the same amount of justification for this nowadays; and the larger part of the blame for the delay in the transmission of goods must be placed at the doors of the railway companies. There is fresh trouble ahead, as soon as the Railways (No. 2) Act comes into force, which is intended to carry out the pledge given by the Government after the railway strike of 1911, that the companies should have the right to make an increase in their rates, on satisfying the Railway and Canal Commissioners that there had been an increase in the cost of working (excluding the cost of carrying and dealing with passengers) through the improvement in the conditions of employment of their labour and clerical staff. The endeavour to give effect to the promise has been beset by many breakers and shoals; and the Government have found it very difficult indeed to impart satisfaction to any one. They have had difficulties created by, and pressure brought to bear from, the railway companies and traders, and public opinion, as swayed by immediate interests, has also been applied.

The first attempt to give effect to the 1911 undertaking was made in Railways Bill No. 1, which was ultimately withdrawn. Then No. 2 Bill was introduced; and, during its passage through Parliament, there was a terrible storm, owing to the decision of the Government to apply a time-limit to the operation of the measure. The limitation proposed was five years, subject to extension, under the Expiring Laws Continuance Act, so long as Parliament desired it. There was no stipulation as to a time-limit when the Government gave the pledge to the railway companies in 1911; and therefore the railway companies stimulated an agitation against the limit, which resulted in the House of Lords rejecting it. It is a pity the question of a time-limit was not appended to the pledge in 1911, as the omission placed an argument in the mouths of the supporters of the railway companies of which the gas industry has frequently made use. "A bargain is a bargain," said that man of business Lord Joicey in the House of Lords; and a majority of the Peers accepted the obvious truth, and would have nothing to do with the after-thought of a time-limit. Though there has been great and almost perennial complaint from traders as to their treatment in the past by the railway companies, and though the measure is going to bring increased cost on goods traffic, we are not sorry that the time-limit was rejected by the Peers. Did we express ourselves otherwise, it could never again be argued in these columns, as it has been often argued in the past, that, upon the permanent good faith of Parliament, the stability of industry and commerce largely depends. If, too, in the future and on the occasion of an industrial war, the Government intervened, neither one nor other of the parties would be prepared to place reliance in governmental promises, if there had been this violation on the present occasion.

There can be no question, now that the matter can be considered in the present industrial calm, that the Government's pledge, given in haste with a view to ending a paralyzing deadlock, would have been better had it been a little more comprehensive in its conditions. The railway companies claim, in terms of the pledge, that this measure shall be permanent in its operation. There would not be any great objection to this—seeing that they have to prove to the Railway and Canal Commissioners that an increase of rates is justifiable—were it not that they have only to prove justification by the improved conditions of employment of their labour or clerical staff. No other factors are to count. No matter future economies arising from any source; no matter the improvement of position by the general prosperity of the country—there is only the one thing to be proved in justification of higher rates, and that is that the conditions of employment have been improved. This is strictly in accord with the promise of the Government. More is the pity. In other businesses when trade increases and profits improve, wages rise, without imposing the increase on the customers. But here, whatever happens, the railway companies are hoping to have permanent possession of the right to recover from increased rates the costs of improvement in the conditions of their labour and clerical staff. There is one small consolation in that it is within the province of the Commissioners to fix a period at the expiration of which the question of justification may be reopened. The measure, we fear, is going to give the Railway and Canal Commissioners some considerable trouble.

Good Results from Old Practices.

THE characteristics of the Presidential Address that Mr. W. S. Morland, of Gloucester, delivered to the Midland Association last Thursday were experience and candour. To a large extent the address was composed of a description of the practices at Gloucester. Some of them are of the traditional order, and some of them are what many people who follow other practices describe as old-fashioned. But Mr. Morland went on detailing the practical belief that is within him, and left the justifying *dénouement* for almost obscure paragraphs at the end of his address, where he tells us—modestly but very properly—that the ordinary selling price of gas in the cathedral city where he works is 1s. 10d. per 1000 cubic feet, with 5 per cent. discount, which brings the net price down to 1s. 9d. This is for gas of an average 16½-candle power, as tested by the No. 1 burner, and a gas containing an average of only 10·37 grains of sulphur compounds per 100 cubic feet, and free from carbon dioxide. It is found, too, that the make of gas (according to the latest figures in our possession) is round about 11,000 cubic feet; and this from a mixture of Yorkshire, Derbyshire, South Wales, and Forest of Dean coals. It is also noticed that the average cost for wear and tear at the works over the past fifteen years has been only 1·84d. per 1000 cubic feet of gas. These are figures that will bear comparison with those from the best of works. They are material facts beyond dispute; and they command our respect.

We cannot afford to dub as old-fashioned, or to treat with contempt, any set of conditions, or part of a set of conditions, that find an expression of justification in such figures. But, of course, these figures do not alone constitute a sufficient reason for saying that Mr. Morland's practices would be the best for application to all local conditions, in regard not only to coal and gas, but to residuals and labour. He uses stop-ended retorts, with machinery both sides of the benches; dry mains are also the vogue, as in the case of the President's neighbour (Mr. R. O. Paterson); a Körting-Cleland steam-jet exhauster is used; and lime purification is employed. In all respects, Mr. Morland, under his own circumstances, appears to have satisfied himself that his adherence to these practices has reached an irreversible stage. With his financial and gas qualitative results, it would be impossible to shake him into any other belief than that he could not do any better, if as well, by a departure from them. There would be no sound reason for his abandoning his position so far as can be seen at the present time, though we should hesitate to say that

there are no further economies to be achieved by modernization at some time or other which would enable Mr. Morland to do even better than he has done. In structural matters, the President has a very definite preference for brick-built retorts, on account of their durability and ease of repair. Such retorts cost money. It seems that his experience with ordinary clay retorts dates back to when he was a boy, and so to the days when his respected father was in charge at Gloucester. We will not venture to say how long ago that experience was acquired; but it evidently did not leave a very good impression. However, there has been a Refractory Materials Committee since then, and conferences between the Committee and the manufacturers of fire-clay goods; and a higher standard of manufacture has been established. It would be hardly fair now to judge of the relative advantages and disadvantages of brick-built and clay retorts excepting on the most modern productions. There is no question as to the good life of brick-built retorts, owing to the facility offered by them for repair. Mr. Morland speaks of some of the retorts having run for more than ten years. That is excellent work for horizontal retorts; but certain of the verticals are threatening to eclipse the longevity of the oldest inhabitants of horizontal retort-settings. Dr. Bueb has mentioned the prospect of a life of 25 years for Dessau retorts; and calculating out figures supplied by Mr. E. Körting for some of the retorts at Mariendorf, we find he is looking for a useful life of 18 years, on the basis of 200 working days a year. So that horizontal brick-built retorts are not going to be allowed to take the lead in age records among the different forms of carbonizing plant.

Another thing that costs money is having retort charging and discharging machinery, as well as means for the removal of coke, on both sides of the retort-benches. Thereby capital and labour charges are increased per ton of coal, or per 1000 cubic feet of gas. This additional cost Mr. Morland must have to incur through his preference for stop-ended retorts, owing to the fact that, when he experimented with through retorts, he experienced troubles with stopped pipes and thick tar accumulations in the hydraulic mains. It is a question whether relief from these disadvantages can be claimed to be sufficient compensation for the extra cost that appears to be attached to the favoured practices. But Mr. Morland can always drive one into a corner in the argument by reference to his gas price and quality. Against which the fact may be pointed to that in other works, and with a large variety of coals and mixtures of coals, through retorts and heavier and longer duration charges have produced considerable relief from the very troubles of which Mr. Morland complains. When we look at the facts drawn from an extensive general experience, the idea grows that some day there may be means applied at Gloucester through which there will be further economy, and the present low gas price, over which there is some pride, will then—market conditions being of a genial character—fall lower still.

There are several hints to be drawn from the President's working experience, as outlined in the address. But we leave them, for the more general topic which supplied the material for the opening part of the address. The country's prosperity is a matter for pleasure; and the gratification would be greater still, were it not for the shadow thrown over industry by dear coal and other materials. The price of coal is the uncertainty of the present, and the subject more than any other of speculation. Were it not for this, though sulphate of ammonia prices are unsettled round about the best figures, the outlook for the gas industry would be entirely one for rejoicing. This prosperity of the gas business is due to the general conditions of trade, to the experiences of gaseous heating during the coal strike, and to the growing application of gas to purposes for which solid fuel has been hitherto employed. In Gloucester gas received a splendid testimonial during the coal strike. The Gas Company were well prepared for the latter; the Directors and the President having realized some time prior to the disastrous event that, in view of the changed labour conditions of the times, it was their duty to hold larger coal reserves. Their decision was arrived at after the railway strike of 1911; and Mr. Morland had such a comfortable time of it, through having two months' supply of maximum requirements in hand when the miners left work, that he has fixed upon that period as his new coal storage standard which will give him safety and a margin. The President is right in looking at the present labour conditions with a suspicious eye. The last few years have seen the forces employed by labour in trying to compel compliance with its demands increased in severity and comprehensiveness; and the scheming brains are not in future going to lose any strategic point that they can employ. During the last coal strike, note was duly made by labour of the fact that much time was given to industry to make preparations for a strike; and those who neglected to use the period of grace will not be again caught napping the same way. Should unfortunately a big national strike again occur, there will be sharper movement on the side of labour than on the last occasion. That, too, is the President's view. "In my opinion," he says, "we shall not get as much warning as we had this "time when the next strike comes along." Touching well-advanced provision, a quantity of the coal that the President used during the last strike had been in store some twenty years; and this fact caused him to allude to one or two points that have been debated, and in regard to which the President's views are on the right side. This twenty-year-old coal he found had only depreciated in its yield-value by about 10 per cent.; and as depreciation takes place at a more rapid rate on first stocking coal than afterwards, there is little reason for incurring the expense of periodically moving stock for use, and then of replenishing the stores. That was one of the points in Mr. W. R. Herring's recent lecture at the Manchester University; and it is a good economic one. It is a pity to suffer, year after year, the depreciation of fresh stocks, and the cost of handling the coal out of and into stock. Naturally one cannot have stocks of coal and at the same time the money which they cost; yet such stocks form a good investment. There is in them protection of interests; they also avert the necessity of purchasing when coal is at strike prices.

The President looked upon his address as a modest production. But there is a genuine ring about it; and it has the good merit of being composed of practical experience. It interested at the meeting, and will interest many others. It gives us facts relating to practice that savours of an older school, and these facts are not to be lightly destroyed and swept away by the facts that have been set up by modern practices. If all had been able to do as well as Mr. Morland, and there was nothing else but gas price and quality to think about, the establishment of new processes and practices would have been of slower growth. But there are matters not mentioned in the address that do weigh, and upon them the various new processes and practices largely take their stand.

The Way to the Greatest Industrial Service.

We most sincerely compliment Mr. J. C. Belton, of Chester upon the material and style of his Presidential Address to the members of the Manchester District Institution last Saturday. There is a wakening spirit about the thought and the manner of its transference to those who listened, and to those who will read, that cannot fail to be very beneficial in these days. We are prone at times to get lost in the almost bewildering number of current claims upon our consideration as participants in an industry that at this period has remarkable opportunities, if each and all are prosecuted to its and their proper issue. There is a growing activity in connection with some of the claims; an almost universal lethargy prevails in regard to others. But duty and responsibility demand that no one obvious means to the end of development and advantage shall be neglected. The new President of the Manchester Institution in his deliverance focussed several of the current claims; and the best we can hope is that, having heard or having read, no member of the gas profession will lay aside one by one the subjects of the composition with the comforting thought that there are active spirits in the industry who are better qualified and able than he to pursue these matters, and see to their proper evolution. We are convinced that, for those who are administering in any capacity the gas industry's affairs, there is much more than the daily round that should receive their consideration and vigorous support. These are the times for solidarity in work beyond the duties of the day's gas making, distribution, and sale, which duties will only be successfully fulfilled in the future by the measure of activity now given to the effectual assailing of the barriers to proper development which oppose in every direction, and to conferring upon the industry its fullest right to high "status in the "public estimation."

The movements of the past few years have advanced this state of solidarity by providing the means for bringing

it about; and the President did not surpass the legitimate bounds of his position in laying claim to the Manchester Institution having done its part in fostering the means that help to the ends in view. Convince the Manchester men that what is desired is good, and they will take their place in the forefront to secure the end. In all parts, there are the obscurants who place themselves in the way of natural development; but their obstinacy has to be ignored, and advance must be made in spite of them. There are the elements to-day for producing solidarity. The President points to the Institution of Gas Engineers, to the Society of British Gas Industries, and to the British Commercial Association. These forces, having regard to their influential composition, combined in some still closer manner, would form a still greater power in the land; and that is the starting point in the work that lies before the industry. The President pleads, as others have pleaded before him, for the establishment of a central body in the nature of a national industrial organization for the entire gas interests. The need is widely recognized; it will be recognized still more, until eventually the inevitable comes about. The arguments that were at one time effectually raised in opposition are being suppressed by a fresh order of opinion. One of the arguments that has had its day was that the polity of companies and municipalities was so much at variance that those representing the administrations could not gather under the same roof. It would be preposterous for anyone to hold that view to-day. The British Commercial Gas Association has done more than any other body to help to kill so vague and insecurely based a notion. Things are being seen to-day in their true light.

In everything technical and commercial, there is common ground between company and municipal gas undertakings. Private gas enterprise has opposition where a municipal electricity undertaking exists; municipal gas enterprise has opposition where a municipal electricity undertaking exists. It is as much to the interests of those who loyally conduct municipal gas enterprise as of those who conduct private gas enterprise that everything possible—political, scientific, and commercial—should be done to advance the interests of the gas industry. Those who are entrusted with municipal gas enterprise want the help of those who have charge of company enterprise, just as much as the latter want the powerful aid of the former, in setting up scientifically the claims to merit of the produce of the gas industry, and in protecting its legislative and financial interests. The past session of Parliament, and the meeting of the British Commercial Gas Association, made a more effectual disclosure of a common ground, as well as of common interests, than anything else that has been done in the whole history of gas supply. The division of interests was at one time considered to be largely traceable to the large appetite of municipalities for profit appropriations in aid of the rates. We have to-day to divide the gas administrations from the general body of municipal government; for there is a large antagonism bred and nurtured by membership of corporation gas committees to the dishonesty and evil of these profit appropriations. In the suppression of this dishonesty and evil, gas committees would be very glad of the assistance of a central industrial authority. We believe with Mr. Belton that, at the base of the highest industrial efficiency and usefulness, there must be undivided organization and service; and this is an argument that has been urged in these columns now for some years—ever since, in fact, it dawned upon us that the organization of the gas plant and appliance manufacturers would make, as it has done, for the development of industrial work and efficiency.

The commercial publicity movement, and the operations against the attack of the chemical manufacturers, are arguments in favour of solidarity in a central industrial organization. The President gave credit to the Gas Companies' Protection Association, to the Institution of Gas Engineers, and to the Association of Municipal Corporations for their union in resisting the chemical manufacturers' attempt to reduce the industry's commercial efficiency, which union was more effective than separate action by companies as represented by the Gas Companies' Protection Association, by municipalities as represented by the Association of Municipal Corporations, or by professional men as represented by the Institution of Gas Engineers. In collecting evidence, and in organizing the opposition—though everything possible was done that could be done under the circumstances of present divided organization, and to the lasting credit of those responsible—a corporate industrial body would have been in these circumstances of inestimable advantage. The President urges that all gas undertakings who had restriction placed upon them in the session of Parliament now closed should get it removed as early as possible, and that all gas undertakings should take as large an advantage as possible of the interpretation that has been given to the residual products powers already possessed. In this advice we see advantage—the advantage of bringing the open market and competition to bear in maintaining prices for raw liquid residuals and spent oxide. We know of two or three cases in which better prices for residuals than heretofore have been offered by chemical manufacturers since the decision of the Joint Committee. Through their ill-advised action in the past session, the chemical manufacturers have done more to open the eyes of the gas industry to their opportunities in the matter of their bye-products than anything that the gas industry itself has done of its own initiative. For this, but this alone, the chemical manufacturers deserve the warmest thanks of the gas industry; though they themselves may rue the day when they set out on their quixotic adventure.

The publicity and educational work of the gas industry is well in hand; but to give it a full potentiality, it wants behind it the whole gas industry. The President points to much work to be done; and he specially instances the subject raised more than once by Sir Corbet Woodall, as to the education in cookery of the mistresses of working-class households. This is both a national health and an industrial efficiency question. But the matter cannot be properly and universally prosecuted by the gas industry as it now stands in the matter of organization; and yet it is one of those neglected duties that serve as the negation of the claim to be in all respects a live industry. There is another matter which can only be forced to a finish by proper means and by a representative industrial body persuading governing authority to take action. This is the improvement of the education of the gas-fitter. It is a matter of vital interest, and one which, as the President urges, should not be left until it is an act of illegality for any man to undertake gas-fitting work who is not in possession of a certificate showing his competence. It is high time some effective measures were taken to safeguard both gas producer and consumer. The business of the producer is imperilled by inefficiency and ignorance; and lives are endangered by the same causes. The tragic occurrence in South London—in which an unventilated old-style gas-geyser with a defective burner was the cause, but which would have been perfectly safe if it had been properly installed (as it would have been had the Gas Company carried out the work)—comes as a sharp illustration of the need of competence being the subject of certification. In connection with competition, there is much else to be done in addition to publicity. There are claims as to superiority of gas light compared with electricity to be scientifically established in a manner that will be received as authoritative by the community at large. The public are becoming more alive to the fact that electrical postulation is a deceptive thing; and that the harm and risks associated with electric lighting are of a material and not of an imaginary nature. But the seed that has been sown by the gas industry to meet the electrical denial of actuality of merit of the gas industry's produce would fructify faster and more extensively by the work that an influential industrial organization could put in hand.

Other subjects of the address were the coal strike, coal stocks, and the application of retort-house advances. They do not bear so much upon the lines of this comment as the other matters to which reference has been made. Yet there is in connection with the last-named subject a point in the address, which shows a singular twist in the municipal government of competing trading enterprises. It will be difficult for those who are not acquainted with the actual facts to believe that, in some places (fortunately only in some), uneconomy exists as a principle of management among members of local authorities, through gas committees not possessing plenary powers. We are not here suggesting that they should have such powers. But we have known—and the President knows—of many instances in which recommendations that have had for their object the suppression of uneconomy or waste, by the adoption of plant that would produce economy, and ultimately advantage for the gas consumers, have been rejected, for no reason that could be discovered other than a desire to check any movement that would be a disadvantage to the electricity undertaking. The displacement of labour is sometimes dragged in as an

excuse; but that breaks down immediately it is examined. This is an age when the voice of the economist is often heard; but his teachings are daily being flouted in municipal government.

The principal lesson that we extract from this luminous address by Mr. Belton is that our right industrial course lies in the bringing to our aid the most effectual means of advancing the interests of the industry, and the best service of the industry to the community. At the foundation of these means is solidarity of organization.

Growth of Business with Existing Consumers.

In several of the reports and accounts that have been received this half year, there are indications that the loss of ordinary consumers and the change-over of old ordinary consumers to the prepayment system have about reached bottom-level; and that the consumption-reducing effects of the incandescent burner are not now of an appreciable character half year by half year. On the contrary, we have seen figures which show, in some undertakings, a substantial increase in the number of ordinary consumers, as well as good increases in the average consumption per ordinary consumer. Mr. W. G. Bradshaw, in his address from the chair at the meeting of the Commercial Gas Company on Thursday last, called attention to this current phase of the business. The Company's sales of gas last half year increased at a good rate; but what was very satisfactory was that the sales of gas by ordinary meters were the highest that have been experienced for nine years. This is due to a growth of the previously existing ordinary business; and building up consumption through the existing services and meters is really the best and most economical extension of business that a gas undertaking can obtain. To cultivate a good kitchen and heating load through present meters by providing the means of heating on easy terms is generally a better investment than having to provide new services and meters to obtain additional business for lighting only. The lines of the current development of business make it more and more necessary that the price of gas shall be as low as possible, and that everything possible shall be done to prevent fluctuations. In the case of the Commercial Company, their position is such at the end of the half year that they could now well afford, if the coal and oil markets had been more favourable when contracting for their current year's coal supply, to have given their consumers (including a large proportion of poor people) and the industries of their area, a reduction of 2d. in the price of gas. But the Company dare not do it. The 2d. must be a reserve against the higher costs with which they are faced. The Engineer (Mr. Stanley H. Jones), however, possesses a bright optimism as to the capacity of his staff, men, and plant to meet the repressing condition of the markets for raw materials. There were several matters of general interest in Mr. Bradshaw's address which will repay perusal. While writing, we should like to congratulate the Secretary (Mr. F. J. Bradfield) on the recognition that was made of his services at the meeting. Mr. Bradfield is the author of the analyses of the accounts of Metropolitan and Suburban Companies, which periodically form a feature of our pages [see *ante*, pp. 452-3].

Coke-Ovens and Bye-Products.

In the paper which Mr. J. E. Christopher recently read before the Manchester Section of the Society of Chemical Industry (a large part of which is reproduced in our columns to-day), he calls to mind the description that the late Dr. Angus Smith applied, in one of his reports under the Alkali Acts somewhere towards the end of the seventies, to the coke-oven processes. They had, he said, "all the appear-"ance of roughness and savagery which extravagance always "possesses." Such a condition has been left far behind by the status of the best coke-oven practice in these days, towards which status there is a general gradual working-up, but it does not represent the ultimate refinement and consequent economy that will be reached. This is all made clear in Mr. Christopher's paper, as well as in the literature of the subject, which has traced development, as published from time to time in our columns. The gas industry's interest in keeping track of the advances made in coke-oven practice is really of a threefold character. There are various gas-works on the Continent and in America that have adopted one or other of the heavy carbonization systems; and, in this country, the Birmingham Corporation Gas Department has now its coke-oven installation, largely for the purpose of providing metallurgical coke for district manufacturers. It may be expected that the experience there will result in the partial adoption of the system by other large gas undertakings situated in centres where there is a market for coke of the kind, though such systems will not, or rather cannot, for general gas-works purposes, displace the vertical systems of carbonization, or the horizontal system worked on modern lines. The second point of interest for the gas industry attaching to the coke-oven system is that several towns in Germany and in America are now supplied with gas from the large coke-oven installations in the colliery areas; and in this country a few villages in proximity to coke-oven plants are also so supplied, though certain of them found a disadvantage in this during the last coal strike. Lastly, but really of primary importance, the modern bye-product recovery coke-oven plants are large contributors to the markets for the residual products of the gas-supply industry, and their contribution will grow. The attentive watching that there has been in our columns of the economic development of the coke-oven industry is more than justified by the position it occupies to-day, and will occupy to its own higher advantage in the future.

The first two considerations to which allusion has been made, are referred to by Mr. Christopher in his paper; but the greater part of it is directed to an examination of the progress of coke-oven practices from the wasteful to the still expanding economic situation of to-day. While, from the selfish point of view, the gas industry could have desired that the coke-oven industry had remained under its old crude conditions, the gas industry has to accept participation in economic progress with the rest of the world, and be thankful that, in these matters, barbarous waste is being supplanted by practices that add to the general wealth and well-being. It has also to be thankful for the fact that the considerable addition to the supply of certain commodities through the development of coke-oven systems has not so far affected its financial position, although naturally it has imposed restrictions on its own opportunities. In regard to the financial position, we have used the safeguarding expression "so far;" but the outlook does not suggest any reason why the development should affect the gas industry financially. Things are not standing still. We have not arrived at any *cul de sac* in the matter either of demand for our bye-products, or of the discovery of fresh uses. At the same time, the gas industry finds interest in keeping its eyes on the developments in the coke-oven industry for the purpose of seeing the trend of things both technically and commercially. As a matter of fact, the interests of the two industries have now so much in common through the inevitable consequences of progress that it is to their advantage to make united cause in prosecuting work for the opening up of fresh outlets for their commodities, and in upholding markets.

Looking fairly and squarely at the relative positions of the two industries, we are not at all sure that, in the immediate future, the coke oven industry will not occupy the dominant position in the quantity of sulphate of ammonia produced, and the quality of its tar for certain purposes. It was seen quite recently that to the country's estimated production last year of sulphate of ammonia (379,000 tons), the coke-ovens and carbonizing works of this country contributed 132,000 tons, against the 166,000 tons of the gas undertakings—the balance coming from iron and shale works. What of the future? We know that if the whole of the coke-oven plants of the country were of the modern bye-product recovery types, that the yield of sulphate of ammonia, taking the low average of 20 lbs. per ton of coal, would probably be somewhere about double what it is at the present time; and if the nitrogen percentages did not vary in different coals, and all the coke-oven plants reached the claims of the best types—from 30 to 32 lbs. (up to 39 lbs. is also mentioned) of sulphate of ammonia—the present yield of the coke-oven plants would be treble what it is to-day. This bye-product recovery business is not a new one; but its efficiency development in recent years has been a notable event in the carbonization of coal for the production of coke for metallurgical purposes. Attempts were made at recovery as early as 1859; and by 1877, there were plants at work which gave per ton of coal 10 gallons of tar and 16 lbs. of sulphate of ammonia. Contrast this 16 lbs. with the figures just named for the new direct processes of to-day (which are more economical than the semi-direct)—30 to 39 lbs. per ton of coal carbonized. Of course, such figures must be

obtained with coal of exceptionally good quality in respect of nitrogen content, as in the best of gas-works practice, with the coals used for gas making, a yield of 28 lbs. is on the higher scale; while from rather under 20 to 24 lbs. is more the usual figure. All coke-oven plants are not on the bye-product recovery system; by a change-over, there is a prospect of greater contribution to the sulphate of ammonia supply. Many of the recovery plants, too, that are in use, cannot boast of a production of more than 16 lbs. of sulphate of ammonia per ton of coal. But work is going forward to eliminate the losses, and to obtain greater efficiency; so that there is a prospect of a larger supply from this direction. From these general facts, it will be seen that there is much scope for a considerable increase in the supply of sulphate of ammonia from these quarters.

In regard to tar, more attention is being paid to this by those in technical charge of coke-oven plants; and the temptations to do this were never stronger than to-day—in view of the better price of tar, the outlets that have and are developing for tar with a low free carbon content, and the attractions that the motor industry offers for a refined benzol.

The position and prospects of coke-oven plants in the matters of both sulphate of ammonia and tar cannot be overlooked by the gas industry. There is mutual advantage in watching all technical developments in connection with these bye-products, as well as in mutually developing the markets for their absorption.

The Manchester Institution and the B.C.G.A.

The Manchester Institution, at their meeting on Saturday, took a step that might, on the same stated grounds, be emulated by the other District Associations of the country. In recognition of the valuable services that the British Commercial Gas Association are rendering to the whole industry, it was decided to contribute £5 5s. to the funds; and in order to identify the Institution with, and to show goodwill towards, the forthcoming National Gas Exhibition a cheque for a similar amount is to be forwarded to the fund being raised for that purpose. The Manchester Institution have set a good example. Neither the industry's publicity nor its exhibition work is a matter towards which the professional men of the industry can be expected to make a personal contribution. But there are, as Mr. Edward A. Harman in effect put it on Saturday, many professional gas men who are debarred from direct identification with the British Commercial Gas Association through being connected with local authority gas supplies, but who feel that, in some way, they would like to express their sympathy towards the objects of the Association. Some of the Manchester men felt that this could best be done through a contribution from the funds of their District Institution. Mr. Harman's Committee, it should be mentioned, are contributors to the Association; but all the Manchester Institution members represented by the unanimous vote of Saturday cannot say the same thing. The subscription is not a large one. But District Associations are not wealthy bodies; and there are several claims upon them. But every little helps; and the British Commercial Gas Association—business body that it is—wants to enlarge the number of the sources of contribution as much as possible. The initiative in this matter of the Manchester Institution is gladly recognized. We are pleased to see that the Midland Association have referred to a Sub-Committee the question of considering what can be done in the way of trying to influence those gas undertakings in their area that have not as yet become subscribers to the British Commercial Gas Association.

Whence the Influence?

The Chairman of the Croydon Gas Company (Mr. Charles Hussey, J.P.) is a staunch supporter of co-operative movement for advancing the industry's interests; and in this matter, as in all others concerning the Company's affairs, his views and those of the Engineer and General Manager (Mr. James W. Helps) are in perfect harmony. Speaking at the meeting of the proprietors last Friday, Mr. Hussey gave it as his deliberate opinion that the trend of the industry's development at the present time is partly due to the educative work of the British Commercial Gas Association. It would be difficult to say that this or that consumer came on to the books, or increased his use of gas, through the work of the Association. But that body cannot advertise, obtain the insertion of articles in magazines, and be the means of circulating information, without seed being sown somewhere; and when such seed begins to germinate, there is no telling the extent of the harvest that is going to be reaped from it in time to come. It is ever developing. A gas consumer—perhaps far from the Croydon district—may, through something he has seen emanating from the Association, be led to try some form of gas appliance. He is pleased with his experience, and communicates it to a friend (say) at Croydon; the friend at Croydon tries the same sort of appliance; and he in turn conveys his experience to others. The process of commercial development starts in a new place, and continues. The Chairman of the Bournemouth Gas Company (Mr. G. Crispe Whiteley), it will be seen from the report of the proceedings at the meeting of that Company, gave figures as to the experiences of the Company in the expansion of the sale of gas appliances—apart from the hire connections—including complete house installations for hot-water supply. The figures are worth looking at, as they are an indication of a new order of things in many places in connection with the extension of the gas business of the industry. There is unquestionably something at work more than there has been before. There is talk of the difficulty of making impression on the public mind; but the public mind seems particularly open just now to educative work, and to the influence of experience, in connection with gas appliances.

National Gas Exhibition.

There was another point to which Mr. Hussey referred in his Croydon address. That was the National Gas Exhibition. He looks upon the Company's subscription to this forthcoming event as a splendid investment, as part of the industrial publicity and educational movement. But there is ground for regret, in that there is a goodly proportion of the gas undertakings of the country that are not assisting the organization of the exhibition by deferring the announcement of their support. The proprietors of the Croydon Company are thoroughly in accord with the Directors' action in this matter; and Mr. Hussey made the sensible suggestion that those proprietors who are financially interested in other gas companies should indicate their views on the subject of the exhibition to the directorates of those companies. The idea is a good one; but it is a pity it was not made before so many of the half-yearly meetings had been held.

An Excellent Report.

In addition to the notification of a further reduction of 1d. per 1000 cubic feet in the price of gas, the Chairman of the Brentford Gas Company had some highly gratifying features to point out to the proprietors at the recent half-yearly meeting. The increase in the output of gas during the period under review amounted to the really satisfactory figure of about 10¼ per cent.; and so actively is the business pushed that, at the present time, well over 90 per cent. of the population in the area served by the Company are using gas. Another gratifying feature is the substantial reduction in the capital as compared with the output of gas. In 1906, it is stated, the capital stood at 9s. 9d. per 1000 cubic feet; while now it is only slightly over 7s. 6d. Thus success in both directions is attending the Company's policy of striving to reduce the price of gas and the capital per ton of coal carbonized. The Company came well out of the recent coal troubles; and, as to the future, the Directors do not feel inclined to take any undue risks—having entered into contracts which will, if proper deliveries are maintained, secure the supply of coal for practically two years to come.

Reflectors and Shades.

It is pretty clear that some of the members of the Illuminating Engineering Society do not think lamp makers generally have given much attention to the science and art of reflector and shade production. There are some reflectors that do not usefully reflect; and there are some shades that do not protect the eyes from the intrinsic brilliancy and the harmful rays of the metallic filament lamp. They are shams, and nothing more. The indictment cannot be universally applied; but it is a fact that there is a grotesqueness about some productions that go by the one name or the other, and are altogether of wrong design for the performance of what is required of them. The matter was under discussion last Tuesday, when Mr. J. G. Clark and Mr. V. H. Mackinney introduced it by some notes and a mass of curves. There is no question that the subject is one that has not received the real

study that its importance deserves; and makers should set about seeing that their designs have scientific justification. There is great economy to be extracted from properly designed reflectors; and the illuminating engineers say that there is good business to be done in reflectors and shades having a legitimate title to classification under these names. Advice was freely flowing at the meeting. The lamp makers were advised to have their lamps tested at independent laboratories, and supply polar curves and full information as to the conditions under which certain illumination duty and candle-power readings are obtained. Really, to speak of a lamp as of a certain candle power, and to say nothing more, is insufficient. The illuminating engineers are going to alter this meagre description. Then the glass makers were advised to step into the work of providing home-made and large-size glass bowls for semi-direct lighting; for the time is arriving when the fashion will be to have all light filter through a glass bowl, and then there will be no more offence to eyes by seeing the source of light. We are all going to get more particular about these things under the guidance of our illuminating engineering friends.

Alarm at Lowestoft.

There are several towns in which the rates year after year have to contribute to the support of the electricity concerns; and there are towns where the rates are put up—such as at Newport (Mon.)—entirely owing to a failure on the part of the electricity concerns to make ends meet. In these times, the managers of the electricity undertakings of the country find their expenditure is, in common with other industries, increasing; and many are looking round to find some way for meeting the financial pressure. The other week comment was made on the proposition of the Lowestoft Town Council to sell electricity for cooking and heating at 1d. per unit, and we asked what justification there was for this. On the heels of our inquiry comes a recommendation to the Council from the Electric Lighting Committee (it has been referred back), to increase from 4½d. to 5d. per unit the price of current to private consumers for lighting. Always the lighting consumer, and not the user of electrical energy for other purposes at a lower price! The attributed causes for this proposal is the increased cost of coal, and of all other materials in connection with electricity supply, as well as the continued deficit on the supply of certain cottages. Members of the Council are getting angry over the position of the concern, and talk of wild-cat finance and in other strain that is not complimentary to those who have been responsible for the administration. The ratepayers, too, are getting genuinely alarmed. They feel they have been sacrificed to the fetish of municipal ownership. The Committee themselves are not a little scared over the matter; and they have told the Council very frankly that it is either an increase in the price of current to those who use it, or a general charge upon the ratepayers, the greater proportion of whom do not use electricity and have no desire to do so, and yet are menaced by a compulsory contribution towards the costs of those who do. And we boast of this being a free country!

A View of the Sliding-Scale.

The problem of the best method by which to encourage (under existing conditions in the United States) the investment of capital in public service corporations, was considered at some length in a paper written by Mr. Alten S. Miller, of New York, for the last meeting of the American Gas Institute; and suggestions were made for attaining the end in view. Briefly, these were based on the undeniably fair proposition that those who take the risk of developing a new enterprise are entitled to a greater return than those who invest in a well-established business. The author did not, however, leave his subject here, but went on to point out that the public also are deeply interested in the operation and maintenance of the property after it is established, and should render all possible aid and encouragement to the corporations in securing economical operation and good service. In connection with this matter, too, he had a suggestion to make—that, as an encouragement to economy and rate reductions, the sliding-scale as adopted in this country has accomplished much. In this, he is quite correct. In practice it has been found to work very well indeed; and it is to be doubted whether, among those who have had actual experience of the system in operation, there are many to be found who would agree with Mr. Miller that there is good ground even for the one main objection to the plan which he urges—namely, that it furnishes an inducement to neglect the upkeep of the property. It is true that both the stockholders and the customers are interested in the reduction of the operating expenses; but this does not necessarily mean that it is "quite probable" the reduction will be carried too far. There should be no fear of the adoption of so short-sighted a policy, and therefore no necessity to "so safeguard the system as to compel the upkeep of the property." It would be foolish indeed—to put the matter no higher than this—for directors and engineers to fail to properly maintain their undertaking, for the sake of making a saving the lion's share of which was to go into the pockets of the consumers, and not into those of their own shareholders.

The Eight-Hour Dream.

What is termed a momentous Labour agitation has, it is reported, just been initiated, after prolonged consideration, by the Parliamentary Committee of the Trade Union Congress. The scheme set forth is indeed an ambitious one, designed to carry into effect an idea of which, at different times, much has already been heard. The proposal is that the whole of the organized workers of the country, to the number of some two millions, shall be balloted, between now and June 30, with a view to ascertain whether they are in favour of united action to obtain an eight-hour day for all trades, and, in the event of negotiations failing, whether they will support a suggestion for fixing a day on and after which no worker will work longer than eight hours in any one day. Should the latter course become necessary to adopt, it will be termed "staying in on strike," inasmuch as there is no intention that persons shall leave their work altogether; and this form of movement is stated to be one that has already received the approval of some of the largest trade unions in the country. Whether it will be equally cordially agreed to by the rank and file of the unions, is the point that remains to be made clear. There is no mention as to whether the workers affected will expect for an eight-hour day the remuneration that is now paid for a longer period of work. This should prove to be an important consideration in the settlement of the question.

PERSONAL.

At the last meeting of the Board of the Colonial Gas Association Mr. H. KING HILLER was elected to fill the vacancy in the directorate caused by the death of Mr. William Parkinson.

Mr. R. W. EDWARDS, the General Manager and Secretary of the Aldershot Gas, Water, and District Lighting Company, has been elected a member of the Royal Institute of Public Health.

Many readers will be pleased to learn that Mr. FRANK TEW has been appointed Secretary to the Warwick Gas Company. He was for some thirteen years assistant to his father, whose recent death has caused so much regret.

Mr. W. LAWSON, late Manager of the Gas-Engine Sales Department of the British Westinghouse Electric and Manufacturing Company, has recently been appointed Sales Manager of the Power-Gas Corporation, Limited, of Stockton-on-Tees. The Power-Gas Corporation are makers of the Mond gas plants.

At the meeting of the London and Southern District Junior Gas Association last Friday evening, the President (Mr. D. J. Winslow, of Lea Bridge) said he was pleased to be able to offer the hearty congratulations of the Association to two of the members who had recently received promotion. Mr. E. G. STEWART, their Hon. Treasurer, had been appointed as Chief Assistant at the Fulham works of the Gaslight and Coke Company; while Mr. W. T. HOGG had been given the position of Resident Engineer at the Mitcham Gas-Works.

The Johnstone Town Council have unanimously appointed Mr. JAMES DICKSON, of Forfar, as Gas Manager. Before going to Forfar in 1910, Mr. Dickson was for 3½ years Gas Manager at the new works at Kelty. Previous to this, he had been in the gas-works at Dunfermline, Burntisland, and Broughty Ferry. He served his apprenticeship in the Forfar works, in which he was to be afterwards Manager. He was at one time President of the Eastern District of the Scottish Junior Gas Association, and was also for a time Hon. Secretary and Treasurer.

After his considerable absence from active work, through indisposition, Mr. JAMES W. HELPS has again got into closer touch with his professional duties; and last Friday he was present at the meeting of the proprietors of the Croydon Gas Company, and was heartily welcomed back by them. With the expansion of business the Company are enjoying, they have a lot of work on hand at the present time in the way of extensions; so that, apart from the ordinary claims on the Engineer and General Manager, there is much of an extraordinary character that will require his attention. But Mr. Helps has a good, competent, and loyal staff; and his friends will hope that he will "go slowly" for a space.

OBITUARY.

JOSEPH TYSOE.

THE announcement last week of the death, at the comparatively early age of fifty-eight, of Mr. Joseph Tysoe, M.Inst.C.E., who until recently held the position of Engineer-in-Charge of the East Greenwich station of the South Metropolitan Gas Company, will, we are sure, have been read with much regret by his professional colleagues as well as by his private friends. It will doubtless be remembered that Mr. Tysoe's health failed a year or two ago; and he was granted leave of absence by the Directors. He went abroad for a time, and returned to his duties benefited by the change; but he was at length compelled to relinquish them. This he did at the close of June last year, after twenty-six years' service, and was succeeded by Mr. F. J. Bywater. A few weeks later, a representative deputation from all ranks of the Company—including the Chairman (Mr. Charles Carpenter, D.Sc., M.Inst.C.E.), the Chief Engineer (Mr. W. Doig Gibb), and the Secretary (Mr. F. M'Leod)—waited upon him at his residence, "Colwyn," Westcombe Park Road, Blackheath, and testified their respect for his sterling merits and long service by presenting him with a silver rose-bowl and an illuminated address. The presentation was made by the Chairman, who eulogized Mr. Tysoe's work, of which he said he had had many opportunities of judging, and expressed the hope that his retirement and release from the cares of business would bring him better health, and that he would live long to enjoy his rest. This hope, unfortunately, was not realized. Heart trouble was the chief cause of his illness; and, though not entirely unexpected, the end came rather suddenly, as he had rallied considerably during the few days immediately preceding his death.

Mr. Tysoe was born at St. Ives, Hunts, in 1854, and was educated at Huntingdon. After being for about twelve months with the West London Junction Gas Company, he became articled to Mr. John Eunson, Manager of the Northampton Gas Company, who had also an extensive practice as a consulting gas and water engineer, and with whom Mr. Tysoe served six years. During this period he became a student of the Institution of Civil Engineers, gaining two Miller prizes for essays. Leaving Northampton, he proceeded to Bahia, as Assistant Gas Engineer, and for three-and-a-half years filled this position, which was one of considerable and varied responsibility. Visiting New York on the termination of this engagement, he spent a short holiday in the States, and also visited Canada. On returning to England, he was appointed Assistant to Mr. John West, the Chief Engineer of the Manchester Corporation Gas Department, under whom he had the supervision of alterations and extensions at various stations. He also had charge of the construction of the Bradford Road works, which he completed and brought into operation. In 1886, Mr. Tysoe was appointed Engineer of the East Greenwich station of the South Metropolitan Gas Company, then being built. Manufacturing operations commenced in 1887; and subsequently Mr. Tysoe had charge of the construction from time to time of extensive additions, till the station became the principal manufacturing works of the Company. It has now reached a capacity of 27 million cubic feet per diem, or one-half of the Company's output. In these works may be seen evidence of the ability and knowledge possessed by Mr. Tysoe as a practical civil as well as a practial gas engineer.

Mr. Tysoe's residence in Bahia, and his knowledge of the country and the language, proved useful in after-years in a way which he would never have anticipated; for it may be remembered that he was sent by Sir George Livesey to Brazil to report upon the position of monazite sand at a very critical time, with the result that the subsequent action taken by the Company was the means of ensuring a supply of material for the production of incandescent mantles at a cheap rate. He subsequently visited the United States on similar business.

Mr. Tysoe was admitted to the Institution of Civil Engineers as an associate member in 1880, and was transferred to the membership list in 1897. He joined the Gas Institute in 1886; but left it, in company with his chief and colleagues, on the formation of the first Institution. He passed into the present Institution on the union of the two bodies; and his name was on the roll at his death. His connection with the Southern District Association of Gas Engineers and Managers commenced in 1889; and he was President in 1903. His contributions to the "Transactions" were on "Carbonizing by Machinery" (1891), and "Repairing Gasholder Sheeting" and the "Use of Burnt Spent Oxide of Iron in Gas Purification" (1907). Notwithstanding his professional duties, Mr. Tysoe found time to take part in municipal matters. He was twice elected an Alderman of the Greenwich Borough Council, and he also held the position of Chairman of the Rating and Adoptive Acts Committee. His inability, owing to pressure of business, to accept the offer of the mayoralty was a disappointment to his friends. He resigned in November, 1910.

The funeral took place on Saturday afternoon. The first part of the burial service was said in St. John's Church, Blackheath, in the presence of a large congregation, including the Chairman of the South Metropolitan Company (Mr. Charles Carpenter, D.Sc., M.Inst.C.E.), the Secretary (Mr. F. M'Leod), the Chief Engineer (Mr. W. Doig Gibb, M.Inst.C.E.), the station engineers, and many other members of the Company's official staff. A considerable number of the men employed at the East Greenwich works followed the remains of their late chief to Charlton Cemetery, where the interment took place, and where many sorrowing friends and associates gathered; prominent among them being Mr. J. Newbold, an Employee-Director, and his predecessor, Mr. Henry Austin (both of whom had served under the deceased Engineer for many years), and Mr. J. Paul. Numerous and beautiful wreaths were sent as last tokens of respect and esteem—each department at the works sending its own wreath; while the staff and foremen lined the grave with ivy, moss, and flowers. The presence of many of the workmen's wives and children added to the striking evidence of the respect and affectionate esteem in which the deceased was held.

Mr. Tysoe was married in 1882; and he leaves a widow, two sons, and a daughter.

JAMES MALLETT VEEVERS.

WE regret to announce the death, early last Friday morning, of Mr. James Mallett Veevers, the Engineer, General Manager, and Secretary of the Rochester, Chatham, and Gillingham Gas Company. He had been unwell for the past two years. In October last he underwent a serious operation, from which he appeared to have recovered, and he was able to resume his duties shortly before Christmas. Subsequently fresh trouble arose, and a second operation had to be performed early this year; and to the effects of this he succumbed.

Mr. Veevers was the eldest son of the late Mr. Harrison Veevers, the Gas Manager of the Dukinfield, Denton, and Haughton Local Boards, and was born in Preston on Jan. 9, 1863. He had therefore just completed his fiftieth year. He decided to follow his father's profession, and was trained at the Oldham Corporation Gas-Works. On the division of the Dukinfield district, he was placed in charge of the works supplying Denton. He held this position till early in 1893, when he took up his duties in connection with the appointment of Assistant-Manager, Engineer, and Secretary of the Rochester Gas Company, which he had obtained a few weeks previously out of 85 applicants. On the death of Mr. W. Syms in 1894, Mr. Veevers was raised to the position he filled at the time of his death. Under his management, the Company made rapid progress in recent years. The plant was brought up to date, many improvements were introduced, and everything possible was done to secure economy of production and at the same time an efficient gas supply. His relations with the staff were of the happiest kind, and by them his loss will be severely felt.

Mr. Veevers joined the Gas Institute in 1885, and passed into the present Institution. He was elected a member of the Manchester District Institution of Gas Engineers the preceding year; but he left it in 1896. Soon after taking up professional work at Rochester, he attached himself to the Southern District Association of Gas Engineers and Managers.

Deceased leaves a widow, five sons, and three daughters. One of his sons, Mr. C. Foster Veevers, is Manager of the Northfleet and Greenhithe Gas Company, Limited. He was a prominent Freemason, and had filled the office of Junior Warden of the Duke of Athol Lodge (No. 210).

The death occurred last Wednesday of Mr. CHARLES W. STUBBS, the Borough Surveyor and Water-Works Engineer of Macclesfield. Deceased was in his fifty-sixth year.

The death has occurred at Bridlington, at the age of 74 years, of Mr. SAMUEL DAY, who for many years occupied the position of Secretary to the Mirfield Gas Company, but had retired.

The death occurred last Thursday, at the age of seventy-four, of Sir WILLIAM ARROL, the well-known engineer and contractor. He was attending to business a few weeks ago, but had an attack of influenza, which soon developed into pneumonia, and to this he succumbed. The event calls for notice in the "JOURNAL" for two reasons. In the first place, Sir William's grandfather was the first to introduce gas for lighting purposes into the town of Johnstone; and, as will be remembered, he himself was associated with Mr. Foulis in the production of the retort-stoking machine bearing their names. He had a remarkable career. Apprenticed to a blacksmith, he rose to be foreman at the boiler-works of Messrs. Laidlaw and Sons. In 1868, he commenced business as a boiler maker with a capital of £85 and about 30 men. In 1872, the first shops of the now extensive Dalmarnock Iron-Works—the largest girder construction works in the kingdom—were erected. He built the Forth and Tay Bridges, and also the steel work of the Tower Bridge. On the occasion of the opening of the Forth Bridge in 1890, the honour of knighthood was conferred upon him. He was Chairman of Sir William Arrol and Co., Limited, but of late years had not taken an active part in the management of the business. He was a Magistrate for Ayr, Deputy-Lieutenant for Glasgow, and represented South Ayrshire in Parliament from 1895 to 1905. He was an honorary LL.D. of the University of Glasgow, and a Fellow of the Royal Society of Edinburgh. Sir William was three times married; and he is survived by his third wife.

Heer P. Bolsius (of 's Hertogenbosch), who is well known to many "JOURNAL" readers in connection with our contemporary "Het Gas," has been appointed President for this year of the Dutch Association of Gas Managers; Heer N. W. van Doesburgh (of Leiden) retaining the position of Secretary.

ELECTRICITY SUPPLY MEMORANDA.

Batteries and Breakdowns.

Attention has been again directed to the installation of large storage batteries in connection with electricity supply stations. The matter has been raised by a paper before the Institution of Electrical Engineers by Mr. F. H. Whysall; and in it he described the working of a 12,000 ampere-hour battery that has been running for some two years in connection with the Manchester Corporation electricity supply undertaking. The chief duty of the battery is to take 3000 kw. off the lighting peak; and it is also looked upon as a stand-by. The last use is an important one, especially in steam-driven stations where, on an unprovided-for emergency, steam-boilers have to be brought into action. There has been much vexation of soul in electrical circles over the magnitude of the crop of electricity-supply breakdowns—complete and partial—this last year or two; and this unreliability the wise ones are saying is bringing electricity supply into disrepute. Our old friend the "Electrical Review" has made a heart-rending appeal to station engineers not to continue to place economy on a pedestal, but to dethrone it, and give reliability the place of honour, and for that purpose to instal batteries. Better add these as an adjunct to an electricity-supply station than have the perennial danger of collapse of supply hanging over the heads of station engineers and the patrons of the inconstant supply. But immediately after Mr. Whysall's paper was read, there came an illustration of a breakdown against which a battery cannot prevail. Manchester supplied it. The distribution system has been sectionized; and on Feb. 7 a fault developed in one of the sections on one of the positive feeders, and spread to all the others, burning them completely asunder. There was serious inconvenience, though there has been an attempt to minimize it in the Press. This is a class of breakdown where a battery has not much effect. On the subject of batteries generally, Mr. Whysall ascribed to the Manchester one a commercial efficiency of 70 to 75 per cent. But this was for the battery as new; and all electrical engineers are not prepared to accept that as a general standard of efficiency for central station batteries. As a matter of fact, as life increases, the efficiency diminishes. The Local Government Board will not allow more than seven years for the repayment of a loan for batteries; but station engineers claim that they should be granted ten years. Storage of electricity is not the same thing as storage of gas.

Publicity.

Intermittently, the electricity industry has a little shake-up on the subject of publicity. It is accused of a lethargic spirit in this particular matter; and its technical papers tell it that something more effectual must be done than is being done at present. There are various reasons given as to why the electricity supply industry does not wake up to the necessities of the case; one being that municipal corporations and district councils fear that they would be surcharged with the amount of the subscription to any such publicity campaign. Perhaps, too, the electrical papers that occasionally preach publicity are to blame for the indifference to the question by supply authorities. One week they talk seriously of publicity; the next week they depreciate the power of the gas industry in the eyes of the suppliers—or essay to do so. It is a decrepit thing; and its vitality is fast waning. There is nothing at all to fear from it; the time will soon be here when it will be a thing of the past. There are none so blind as those who will not see. The records of the gas industry do not support these preachers of contradictory belief; and we are afraid that those who manage electricity supply undertakings, and know more of the realities of their position in relation to gas enterprise, hold these preachers in small estimation. A paper by Mr. H. Clifford Palmer, read before the Manchester Section of the Institution of Electrical Engineers, is notable for a sound common-sense view of the situation, and for the advice it contains on the subject of publicity and education. There is one point in the paper with which the author will expect us to disagree. It is that the public do not know that the cost of electric light compares more than favourably with gas lighting. Far from disagreeing with Mr. Palmer, we are in perfect accord with him on this point; inasmuch as the public generally decline to know as true what is untrue. And what Mr. Palmer says in this respect takes its rightful place in the latter category. He has followed with intense interest the work of the British Commercial Gas Association, and applauds the methods of the organization. But he deplores the fact that of the 42 million population of the British Isles, only rather more than half-a-million are electricity consumers. There is a mighty difference shown by this comparison; and there is exaggeration and self-disparagement in it. The "population" includes householders, their wives, and children; so that when the promised land is reached—the land promised by the Electrical Press—and every household is electrified, it will be found that, taking an average of five units of the population as comprising a household, the highest possible number of consumers will not exceed (say) 8 millions. It must not be overlooked, too, that the half-million consumers already on the electricity supply mains constitute the cream of the connections the electricity industry is ever likely to get. Of the half-million users of current only a few thousands are users of appliances other than for lighting. That is the field in which Mr. Palmer thinks more education is required. This leads up to the plea for a universal combination between the electricity suppliers, the manufacturers of electrical plant and appliances, and the electrical contractors, and a joint financing of an advertising and educative campaign. Mr. Palmer's ideas are of the large order. He produces an imaginary publicity plan for London and a radius of 50 miles, within which £12,000 a year on joint publicity should be expended. In the scheme, he would incorporate all the lines of work of the British Commercial Gas Association, and, in addition, use street poster stations well, and put up electric night signs. Mr. Palmer is an ambitious counsellor, and he is patted on the back by the part of the Electrical Press that uses the wrong end of a telescope when examining the gas industry. With this patting he must be content; for finance of the order that he requires will not be supplied by any combination of the organizations of the electrical industry. The Electricity Supply Committee can tell a tale of high hopes and frustrated efforts.

Distance Lighting.

One thing that is conceded by the electrical industry is that gas is in a happy position in being able to apply the pressure-wave system to the lighting and extinguishing of street-lamps. The gas industry has an advantage there, and one that has been much emphasized in these times of foggy weather. The electricity industry has made many attempts to secure some form of control apparatus from a central point; but there has not been a satisfactory solution, until Messrs. W. Duddell, A. H. Dykes, and H. W. Handcock came forward recently with a new proposal, which they think (despite various difficulties accompanying it) is going to dispense with the street lamplighter and extinguisher in the case of electricity. The proposal has been under experiment on the Egham and Staines electricity supply system, but there are no details in our possession as to whether the experience has been faultless. The object is effected, on either an alternating current or direct current system, by altering the constitution or wave-form of the main supply current when desired, leaving the mains and the system of distribution untouched. The underlying principle is to control relays, which may be inserted anywhere on the general system of mains, by means of a superposed current impressed on the main current flowing in the system. To enter into all the details of the plan would occupy more space than can be devoted to it here. But the authors do not speak of their scheme with the vigorous confidence that some inventors display. Possibly they are hoping to incite some courageous one to try it on a larger scale than experiment has so far reached. It will be interesting to see what development ensues from the introduction of the system. It is claimed for it that its potentialities are also great in enabling a two-rate system to be applied to many purposes—domestic, industrial, and shop—for which electricity is employed. But the restriction difficulty comes in, and consumers do not like restriction. Reverting to street lighting, the control switch operated by clockwork has been tried to a small extent, but it is not favoured on account of the brainless character of clockwork mechanism; and, in times of fog, this is a disadvantage. Therefore, if a dependable system, the equivalent of the pressure-wave system in gas-supply, can be developed, the electrical industry will be thankful.

A Little Gold Mine.

The Aylesbury District Council have had before them a report upon the much-discussed electric light scheme for the district; and, of course, the report makes out, on a string of hypothetical considerations, that there is (after the period of incubation has passed) a perfect little gold mine in the venture, which will involve an expenditure of merely £17,878! We have seen many similar reports; and we have lived to see the members of several local authorities regret that they were such dolts as to place full confidence in the specious predictions. Experts can plan, and see that one gets value for money in the way of works and so forth; and they are the proper persons to determine the size of plant that should be put down for a certain district. But it is as impossible for them to foretell or estimate in any positive manner what the future is going to bring forth in the way of success as it is for anyone else. If they were certain of their results, they would find it much more advantageous to become company promoters than to advise local bodies to take up these electrical ventures. They prefer, however, that the local authorities should shoulder the responsibility; and members of the local authorities themselves are also cute enough to risk loans raised on the credit of the towns—in this Aylesbury case to the extent initially of £17,878—than risk their own money. The Finance Committee of the Council have presented a statement on the reports of the experts; and the Committee's comments show conclusively that they do not understand a great deal about the matter, for there is much omitted from the document that ought to appear in it. If the rest of the Council are as blind to pertinent matters as the Finance Committee appear to be, then the ratepayers of Aylesbury deserve the sympathy of people fortunately residing outside the Council's jurisdiction. We never saw a scheme with "hypothetical" written in larger characters all over it.

The Diesel Engine.

We have not the space to enter into the finance of the scheme; but just take the one technical point as to the adoption of the Diesel engine. The Council are advised to use this form of driving. Yet the Chief Engineer of the Windsor Electricity Supply

Station writes: "I do not consider the Diesel engine is as reliable as steam, and would recommend you to have ample spares. The upkeep of the Diesel engine is about equivalent to steam plant with boilers, condensers, and superheaters taken into consideration." What are the non-technical councillors of Aylesbury to make out of this in relation to the recommendation. With all the adjuncts of the steam plant, the upkeep of the Diesel engine is about equivalent to it. That does not suggest smooth and reliable working. The Council do not know, or do not care to know in the fascination that at present possesses them, that the cost of fuel is only a fraction of the total costs that obtain in the working of a Diesel engine; nor apparently do they know that only recently the instability of the oil market, and the prospects of that market, have caused at least two electric light authorities to abandon the proposed installation of Diesel engines. Last year there were three serious accidents with Diesel engines at electric light stations—at Bray, Maidenhead, and Guernsey. In the reports before us on the proposed electric lighting scheme, we see much that would make us hesitate before taking part in any responsibility for an electricity supply scheme in Aylesbury which at the very start is going to cause an expenditure of about £18,000. The first expense is not the last. A public meeting on the subject was held last Wednesday; and a referendum on the subject to the ratepayers is to be made to-day.

Rates and Municipal Trading.

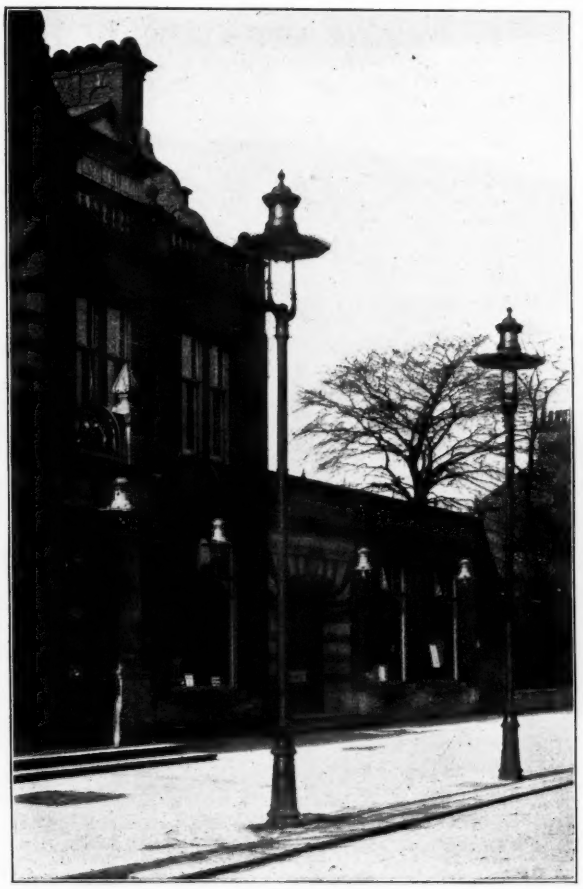
Mr. R. Stewart Bain, the Managing-Director of the London Electric Supply Corporation, has been on the war-path again in connection with municipal trading. Mr. Bain has always had our sympathy in this matter, as his Company, like the gas companies of London, have felt severely how municipal trading inflicts injury upon private enterprise, both directly and indirectly. The times do not lessen the weight of the grievance; on the contrary, it becomes heavier. Not only does municipal trading deprive private enterprise of fields for business, but it frequently brings upon it enhanced burdens through heavier rates. The gas companies, and companies like that of which Mr. Bain is the Managing-Director, are among the largest—in many cases the gas companies are the largest—ratepayers. Therefore the higher the rates, the worse for them; and yet they are in other ways the chief sufferers through the trading that is in part the cause of the heavier local infliction. Mr. Bain, a letter in "The Times" shows, has been investigating the position of fourteen metropolitan boroughs that trade in electricity, as well as that of the non-trading boroughs. He finds that the average rate in the non-trading boroughs is 7s. 6d. in the pound; and the average in the trading boroughs is 8s. 4d. As the rateable value of the trading boroughs is £16,941,778, the extra 10d. in the pound means an addition to the rates of £705,907 per annum. It is easy to see from this how large private enterprises are adversely affected through the rates—more especially those whose interests are being attacked by the trading. The investigation that Mr. Bain has made has established satisfaction on his part that a large proportion of the extra rates is due to municipal trading. He gives those who think otherwise a little nut to crack by asking them to say, if he is not right, why the rates in Bermondsey (where the rateable value is £921,823) should be 9s. 3d. in the pound, while in the adjoining borough of Deptford, with a rateable value of £641,263, the rates are only 7s. 10d. in the pound. Mr. Bain is of opinion that the fault for this is to be largely ascribed to the fact that the municipalities trading in electricity supply are under no obligation to publish their accounts in the form prescribed by the Board of Trade for companies. In the absence of a commercial audit, only such expenses as are convenient need be charged to the trading; the remainder being charged direct upon the rates. The immunity from the provisions of the Electric Lighting Acts in this respect enables the municipal trading bodies to hide from the ratepayers the actual result of their trading. But, without knowing the cause, they find their rates steadily increasing.

Cost of Living.

The resentment shown by Mr. Bain in his letter to "The Times" receives point in these times when—through the course of legislation and of social "reform" of the parliamentary brand, in which the reform entirely benefits one side and presses hardly on all the other sides—industry finds its expenditure largely on the upward grade. Municipal trading undertakings do not escape a part of the additional expenditure; but if the trading is not conducted on a commercial basis, and a commercial profit is not made, then private enterprise in the district has to bear not only its own additional burden in the nature of expenditure, but a part of the extra outlay thrown upon the municipal concern. From beginning to end this is an anomalous condition of things; but it will want something more than sporadic attack to effect any amendment of the strange position in which private enterprise stands in relation to municipal trading. Alluding to the increased burdens upon private trading concerns, the accounts that are now being issued by electricity supply companies, show that the coal strike, the higher price of coal, the National Insurance Act, and other causes have affected the financial position in the same manner that it has done that of most gas companies, but the gas companies have had advantages (which have produced some, if not entire, compensation) in increased gas business and increased residuals trading at higher values.

SILICA CUPS FOR HIGH-PRESSURE LAMPS.

Outside the Tottenham and Edmonton Gas Company's Offices, in the High Road, Tottenham, are the first two examples of multiple high-pressure lamps converted to the silica cup system of the Keith and Blackman Company. The advance which the Keith Company have made in the application of silica cups (which admits of the doing away with the secondary air supply to the lamps, and large glass globes) was fully described, and the advantages set out, in an article published last week. The Tottenham Company have, as the Southern Association paper read by Mr. A. E. Broadberry and the "Journal" records show, done an immense amount of work in parade lighting in the shopping areas of their extensive district; and there is no doubt the success of their large schemes (although Ilford takes precedence in leading the way with a smaller installation) proved a great stimulus to the



The High-Pressure Lamps, with Silica Cups, at Tottenham.

adoption of the parade system in meeting the requirements of the shopkeepers in other gas-supply areas. The two high-pressure lamps that are now to be seen in front of the Company's offices are, however, the most novel of lights to be seen in the district. They are two three-burner lamps that have simply been converted to take a silica cup round each mantle. The lamps appear strange now that one is accustomed to globed lamps; and, in the photographs, the cups only look like the mantles themselves. We have seen the lamps alight; and the idea one gets from the pavement level is that there are simply three large-area mantles hanging from the reflector of each lamp without any more protection than is afforded by the reflector. The silica cups, however, are there; and these cups have, we think experience will prove, done much to remove one of the uncertain items in the maintenance of high-pressure lamps.

Extensions of Dessau Vertical Retort Plant.

We learn that the Vertical Gas-Retort Syndicate, Limited, have received (through their Agents, Messrs. John Terry and Co.) a further order from the Metropolitan Gas Company of Melbourne for an installation comprising six beds of eighteen 5-metre Dessau vertical retorts (1912 type). This installation will be an extension of the existing Dessau vertical retort plant at the Company's South Melbourne works, bringing the total carbonizing capacity of this whole plant to upwards of two million cubic feet per diem. The Syndicate have also received advice from the Dessau Company to the effect that an order has been received for Dessau verticals from the Stuttgart Gas-Works for six beds of eighteen retorts.

THE INTERNATIONAL GAS EXHIBITION AT ANTWERP.

[From Our Own Correspondent.]

This exhibition, which has been organized with great enterprise and energy by the Imperial Continental Gas Association, through their Antwerp branch, which is called the Compagnie de Gaz d'Anvers, was opened on Saturday last. It is being held in the hall of the Société Royale d'Harmonie, a local musical society of considerable influence. The hall, which is built of white stone, consists of a central portion with vaulted roof and two side parts with flat roofs, and lends itself admirably to such a purpose; but it has had to be built out temporarily all along its front to some 20 feet, to accommodate all the exhibits. It stands in grounds of its own, which are surrounded by a high fence. This is brilliantly illuminated at night with continuous curved lines of gas-flames. Over the gate is an illuminated sign indicating in French and Flemish the subject of the exhibition. On each side of the gate has been erected a temporary column some 30 feet in height. On the top of each of these burns a magnificent gas-flare; and a short distance from the top is a powerful searchlight, which sends a piercing glare into the darkness of the night. The hall itself, too, is brilliantly illuminated outside at night. Over the entrance is a high-pressure lamp, and at intervals round the building burn high-power low-pressure lamps. On the roof above the entrance stands a figure holding another gas-flare. The grounds and the band-stand in them are also grandly lighted with high-power lamps; and the whole scene is wrapped in such brilliancy as must attract people from all quarters.

The interior of the hall in no way falls behind the exterior in point of light. Naturally the exhibitors are all anxious to show-off their goods to the best advantage; and the Company have also provided ample pendant lights of high power and one elegant chandelier of high-pressure lights in the centre, besides hundreds of small units round the centre ceiling, in very effective green and red shades.

The exhibition is truly of an international character—England, Belgium, Holland, Germany, France, and the United States all being represented. No pains have been spared to make it a success. In all parts of the town striking posters are to be seen bearing a design taken from the long-service medals of the Association, and the words "Ex Tenebris Lux," which motto, in golden letters, appears also over the entrance to the hall.

On Saturday, all the local taxi-cabs carried small flags bearing the name of the exhibition. On Sunday, two balloons were released from the grounds of the hall, and were chased by some three hundred cyclists—cups being given by Messrs. Hayman, Franken, Hénoux, and Van den Abeel for the first to reach the balloons on landing. In fact, no effort has been spared to attract attention to the exhibition; and it should give a fresh impulse to the already highly satisfactory business of the Company.

The Opening Ceremony.

The formal opening of the exhibition took place at 2 o'clock on Saturday afternoon, in the presence of the chief officials of the province and the town of Antwerp and a considerable number of the public who were invited. Mr. A. F. P. Hayman, who is the Manager for the Imperial Continental Gas Association at Antwerp, and Vice-President of the Exhibition Committee, was supported by Mr. Franken, the President, and other members of the Committee in welcoming the Military Governor of the Province, the Civil Governor, the Mayor, the Aldermen, and the general public.

Speaking on behalf of the Committee, Mr. Hayman thanked them for their presence at the opening ceremony, which testified to the interest they never ceased to take in industrial and commercial development. This exhibition was the first of its kind ever held in Belgium. It was not the creation of any simple fantasy or sudden interested impulse, but was rather suggested by the interests of every-day life, by the ever-growing requirements of industry, and by the ignorance of the general public in this special branch and the unprogressive rut into which they had fallen. The exhibition had been organized to tempt enterprise, to shake old prejudice, to put an end to indecision, and to show everyone that the destinies of the human race were inseparably tied up with industrial progress. It was intended to be instructive rather than anything else; and the progress made by the gas industry was to be demonstrated practically. True, it would show one period of this development rather than the continual progress from the beginning. But it was the result of years of labour and meditation (not unmixed with many a doubt and many a heart-rending disappointment) which had been dedicated to the perfecting of appliances that needed to be brought forcibly to the attention of the public. It was to be hoped, for the general good, that success would attend the enterprise; and this hope was all the more justified as there was logic in every aspect of the case, and logic, after all, generally managed to have the last word.

The Military Governor (who was in uniform) responded briefly on behalf of all present. The exhibition, he said, had been a true inspiration, and he admired the intelligence of the organizers in thus setting a precedent, and forming the first gas exhibition Belgium had ever seen. For these reasons, and for the worthiness of its objects, it richly deserved success. The practical demonstrations could not fail to be instructive. In conclusion, he warmly congratulated the promoters of the scheme on their splendid arrangements, and wished them every success—formally declaring the exhibition open.

The hearty applause which followed showed the appreciation of the sentiments which the General had expressed.

The chief guests then moved off for a tour of inspection, under the guidance of the members of the Committee. At the same time, music was heard from the back of the hall; and an excellent orchestra rendered the first item of a well-chosen musical programme. The public arrived in large numbers at 4.30, when they were admitted for 25 c., and appeared to appreciate not only the exhibits, but also the excellent arrangements made to deal with their requirements at tea-time.

The Exhibits.

In all there were seventy stands, representing almost as many firms. It is naturally far easier to comment on the exhibits collectively than individually.

As is only to be expected at a gas exhibition, the lighting was remarkable, and the general effect of the multitude of lights, with their carefully selected shades, was most cheery. Cheery, too, were the gas-stoves which burned on so many stands, and which were singularly fortunate in view of the real winter weather which prevailed on Saturday. One matter for regret was that the Compagnie de Gaz had no special exhibits of their own; but certainly it was not necessary for them, considering the permanent exhibits that they have in their magnificent show-rooms in the chief street of Antwerp.

The English firms were not showing much that is new to Englishmen; but all their most popular gas-fires and cookers, &c., were on exhibition, and most of these are new to Belgium. Four of them were grouped together on one stand—the Parkinson's Stove Company showing cookers and fires; the Davis Gas-Stove Company, fires, radiators, and geysers; the Richmond Stove Company, fires, cookers, and a washing boiler; and the Carron Company, fires and cookers of all sizes. The last-named firm had also a large baking oven for bread in another part of the hall.

Messrs. Fletcher, Russell, and Co. were showing their "La Regalia" cooker and other cookers of all sizes—all in enamel work; and a diminutive enamelling oven with three burners. The Cannon Iron Foundries were represented through their Brussels agents by a selection of stoves (some in beautiful enamel work), besides cookers and stoves for heating irons. Messrs. William Sugg and Co.'s stand was bright with handsome lamps; and a prominent feature was their "Port-Hole" lamp, for corridor and other lighting. Besides this, the firm had a cooker and a washing boiler.

Messrs. John Wright and Co.'s display contained several novel features. Worthy of mention are their "Calefactor" and their "Sun" boiler—new types of circulator boilers for supplying hot water for domestic purposes. The water is heated up to a certain temperature; and as soon as it approaches this temperature, the flames of the burners are reduced by means of a thermostat arrangement, and finally extinguished if no water is drawn—only the bye-pass flame remaining alight. But as soon as any water is drawn off, the thermostat causes the flames to rise again, so that the water always flows hot. The "Sun" boiler was shown working with a most uncanny automatic hand. The "Calefactor" can be used for hot water pipe or radiator heating on a large scale; but on the same stand was to be seen a gas-heated steam-radiator, the "St. Andrew," in which the gas consumption is automatically reduced as the temperature rises to the required point. Worthy also of special mention is the "Garajo" of the same firm, recommended for use in garages and greenhouses. It is a small dome-shaped gas-heated boiler which is attached to an ordinary circulating radiator, but can itself be placed outside the building, enclosed in a specially-made hutch, and needing no flue.

Mr. George Wilson's display was exceedingly attractive—the meters and other apparatus being daintily set out and all painted in a beautiful shade of brown, very pleasing to the eye. Most worthy of mention among his goods were a safety meter and Rutten's "Comfort" meter. With the former, the timid gas consumer, before retiring to bed, can set the meter to pass only a small quantity of gas more, and pull a small chain marked "night." When the specified quantity of gas has been consumed, no more gas passes the meter, and, moreover, no more can pass at all until each individual tap has been shut off in the whole house. When this precautionary test has been made, a chain marked "day" can be pulled, and gas passes as through any ordinary meter. Rutten's "Comfort" meter is an extension of this system, in which the safety mechanism is situated in any desired room, instead of at the meter. Besides these, the firm showed a pressure-gauge with electric alarum which rings when a specified pressure is exceeded; other wet, dry, and slot meters, and calorimeters.

The Bland Light Syndicate were showing some effective lamps for inverted burners, and also some radiators. The Shipping and Coal Company were attracting considerable attention with a pretty panoramic view of Newcastle-on-Tyne, showing the docks and the loading of the coal which is largely used for making the gas

which was working such wonders at the exhibition. Still's patent machine for making tea, coffee, &c., was busy providing beverages for the visitors.

This completes the list of English exhibitors. There was one gas firm from America—the Union Stove Works of New York, whose cookers appeared rather crude and of rough finish; but no doubt a low price is aimed at, and efficiency rather than ornamental effect was in this way attained. They were represented through their Brussels agent.

The Continental firms represented were too numerous to review in detail; and it is by no means easy to discriminate. Perhaps two of the finest shows were those of A. Pelsmaekers and Nestor Martin, both of Brussels. Pelsmaekers had a bright and attractive stand, with gas-fires of all kinds burning, among which were elegant enamel ones for drawing-rooms, with combination fire-clay and asbestos fuel, many with doors to open and shut; reflector stoves cheerful in appearance but so ineffective; imitation wood-fires; and, finally, a new combination stove for burning gas or coke. This consists of a cylindrical arrangement, one half for coal, the other half an ordinary gas-fire, which turns on a pivot in an ordinary hood. The flue is likewise divided, and the part which is in front is automatically opened, and the other half correspondingly closed. Nestor Martin had a large variety of goods, including handsome enamel stoves for coke, gas-fires, and cookers. They had large hot-plates with boiling-rings suitable for hotel or restaurant use, and one enormous gas-fire in brass work, with fire-clay and asbestos fuel, and no less than thirty-nine burners. Altogether, theirs was a fine show. Richard et Cie., of Brussels, had some striking white enamel cookers, fires, and geysers. The Eisenwerke Gaggenau from Baden had cookers, geysers, and iron-heaters. But, on the whole, there does not seem to be much competition in the manufacture of gas-fires on the Continent.

Chandeliers and lamp fittings were very plentiful; and it is hard to discriminate between the many firms who were showing them. Charles Rey et Cie., of Malines, had some really striking goods, and displayed them to the best advantage. Ehrich and Graetz, of Berlin, were showing indoor and outdoor lamps of low and high power; and Bec Auer (the Belgian Welsbach Company) had a good display of their well-known lamps, burners, and mantles. Other firms represented were the Société Nouvelle d'Incandescence and the Usines Pintsch, of Brussels—the latter making rather a speciality of public lighting, and showing also automatic lighting devices, compressors, and meters. As regards lamps and fittings, there was much that was beautiful, but little that was novel. The firm of Edmond Lambo, however, had their stand fitted as a cosy sitting-room, with a gas-fire and wicker chairs and tables, with a suspension gas-lamp and table lamp in wicker work to match—the whole scheme having a really attractive effect.

Meters of all kinds were to be seen, and with their new shiny paint looked far too ornamental to be hidden away in dark cupboards and cellars. In many cases, they were fitted with glass cases, so that the "mysteries" of their interesting working were revealed to the public. In this branch, there was nothing that calls for special mention, though the stands of G. Kromschroeder, the Compagnie Belge des Compteurs, the Union Gazière, and Henry Rigaux all caught the eye.

There was a fine show of gas-engines and motors, including some by W. Zeyen, J. Schoeters und Company, L. Gots Son, Jules Menig, and Otto Deutz. These were arranged all along one wall of the hall; and it was quite sad to see the power all wasted from dozens of engines which were working away to no purpose. Stuart Turner, Limited, of Henley, who should have been mentioned among the English firms, were showing the application of small motors to machines, such as coffee-roasters and sewing-machines. In another part of the hall J. Schoeters and Company had a large model forge, showing their patent blowers and all tools and equipments for forging. In the same corner was to be seen an attractive display by Friedrich Lux of gauges and instruments required in gas-works laboratories.

Two fitted bath-rooms attracted especial attention. C. Van Dommellen had two complete lavatories, with single and double basins, geysers, and everything that could be desired, showing how really elegant a bath-room can be made. Bernard Young, an Antwerp firm, was showing a large selection of Professor Junker's patents. There were a "safety" stove for nervous people, geysers and reflector stoves combined for the bath-room, a self-regulating boiler for central heating, a patent water-filter which boils the water by gas and cools it at once, and sterilizing appliances for dentists and doctors. The beaten copper finish of all these was highly ornamental. Pipes, fittings, joints, and tools were displayed with the greatest taste by J. Gevers-Hendrickx, H. Janssens-Raymaekers, and Henry Rigaux. Mention must also be made of the automatic igniting device "Pneuma," which was to be seen at the stand of Max Lubliner, and was also fitted to several of the lights in the hall. Extinguishing devices were shown by the firms known as the Société Anonyme Minimax and the Société Matériel.

The Compagnie Générale des Conduites d'Eau were showing pipes, joints, and a small section of an oxide purifier with three layers of grids. A one-tenth scale model was on view of the 20,000 cubic metre per diem installation at Utrecht of the Société Hollandaise de Gaz de Résidu, a system already well known on the Continent, which may shortly be introduced into England. Finally, the model kitchen, fitted with appliances of several firms, was well worth an inspection—being all that a model kitchen should be.

INAUGURAL BANQUET.

On Saturday evening, an inaugural banquet was held at the Grand Hotel—over ninety guests taking part. Among the chief were the English, American, and Dutch Consuls General, M. Strauss, one of the chief aldermen of the city, and M. Pavoux, the President of the Society of Gas Engineers of Belgium. The exhibitors and the local press were well represented. Letters of regret were read from the Minister of Public Works and several other prominent public men. At the close of the repast,

M. Pavoux gave the toasts of the King and Queen of the Belgians, the sovereigns and rulers of all countries represented at the exhibition, and the success of the exhibition itself. He further proposed the health of the Belgian Government and the local authorities of Antwerp. M. Strauss, answering on behalf of the latter, said that they had always made a point of having the best public lighting. He considered that the competition of electricity was very wholesome and beneficial, but was happy to be able to congratulate gas on being, in spite of all, the master of the situation. He wished every success to the exhibition, and sincerely hoped that it might early lead to even greater advances in the gas industry.

Mr. Hayman then proposed the toast of the exhibitors, the judges, and the Press. The exhibitors, he said, were to be thanked for their ready support of the enterprise, which had exceeded all expectations; the judges of the exhibits for having undertaken a task so unenviable in view of the all-round excellence of the exhibits; and the Press for their generous help, which had played such a prominent part in procuring the success which the exhibition promised. The answer for the Press was capably delivered in French, Flemish, English, and German. M. Arthur Martin, of the firm of Nestor-Martin, replied for the exhibitors, thanking the several members of the Committee for the various tasks they had so capably accomplished. M. Brender à Brandis, a former Engineer of the Antwerp Gas-Works, endorsed the last speaker's remarks on the good work of the Committee, and M. Strauss followed with the formal toast of the President, M. Franken, and his colleagues on the Committee. M. Franken responded on behalf of himself and the Committee, speaking in Flemish, because he considered that the majority of men in Antwerp remained, after all, "good old Flemish boys." The toast list concluded with the health of the President of the Society of Gas Engineers of Belgium, proposed by Mr. Henry H. Salomons.

Readers may be aware that Greenwich time has been adopted in France; and, according to a paragraph in "Cosmos," the change has caused a general increase in the cost of lighting at night, and consequently in the receipts of all the purveyors of illuminating agents—gas, electricity, petroleum, &c. The public lamps are extinguished ten minutes earlier than before in the morning; but the saving thus effected is not comparable with the extra expense incurred at night.

The fourth of the course of University Lectures organized by the Manchester and District Junior Gas Association and the Manchester District Institution of Gas Engineers for the present session, will be delivered next Saturday afternoon by Principal J. W. Graham, who will take for his subject "The Hygienic Aspects of Gas." Subsequently a paper on "The Development of Electricity by Gas-Engines" will be read by Mr. F. H. G. Goodwin, B.Sc. (Lond.), a member of the Junior Association.

Electrolytic damage to a riveted steel main of the water-works system of Los Angeles was paid for without the necessity of bringing the case into the Courts. The main was partially destroyed by escaping electric currents from the Pacific Electric Railway Company. For the purpose of determining the best method of equitable settlement, the Department of Public Service and the Company selected a committee of engineers, who made a thorough investigation of the case and awarded to the city $42,500—the full amount asked.

We have received a copy of the first number of the "Lighting Journal," a monthly publication started by the "Lighting Journal" Company, of New York, under the editorship of Mr. Norman Macbeth. A feature of the new paper will be the issue of "data sheets," on which will be abstracted the important points from the articles appearing in its own columns, and in the "Transactions" of the Illuminating Engineering Society and other associations They will be so placed as to allow of easy removal for filing. A special kind of type has been adopted for the articles.

The first use of pitch for road making is the subject of a communication by Mr. E. W. Gudger in "Science." Pitch was used locally in Trinidad prior to 1836. Eirinus, a Greek physician, in 1712 employed asphalt from the Val de Travers (Neuchatel) as a protective coating for stone and wooden walks; but it appears tc have been used as a road-building material by Count de Sassenay in France as early as 1832. Asphalt was not used for street paving on a large scale in Paris until 1854. The material was first used on the streets of London in 1869. The first pavements of this type in the United States were laid in Newark (N. J.) in 1870. The following year saw streets in New York paved with asphalt. Its use on a large scale in America began with the rehabilitation of the streets of the national capital at Washington in 1876-7. Asphalt was known to the ancients, and is said to have been used as a binder in masonry in Babylon.

WATER LEGISLATION FOR 1913.

[THIRD ARTICLE.]

AUTHORITY will be sought by the Metropolitan Water Board to construct works and acquire lands, and for other purposes. The works comprise a service reservoir in the parish of Eltham, two others in the parish of Westerham, and thirteen aqueducts, conduits, or pipe-lines; a wharf or landing-stage on the northern bank of the Thames at Hampton, and seven lines of railway in connection therewith. Fifteen years are required for the completion of these works; and the Bill contains general provisions for the protection of gas and water mains and sewers while they are being carried out. The Board on the one hand and the Conservators of the River Thames, or any company, body, authority, or person, on the other, may enter into and carry into effect agreements and arrangements with respect to the construction, maintenance, and user of the wharf or landing-stage, and the works connected therewith or incidental thereto. Power is sought to acquire certain lands at Hanworth and Sudbury for the purpose of making filter-beds, and others in the parish of Camberwell for the Rock Hill reservoir. The limit of time for the compulsory purchase of lands is seven years. Powers already granted for works and the acquisition of lands are to be revived; and the Board ask for an extension till July 20, 1928, of the time limited by the East London Water-Works Act of 1900 and the Board's Act of 1906 for the construction of a reservoir, and till seven years from the passing of the Bill for the completion of certain conduits or pipe-lines sanctioned by the first-named Act. The Board apply for power to borrow £1,250,000 for carrying out works; £6000 for the provision of locomotives, rolling-stock, &c., in connection with the railways already mentioned; and other moneys, of which the amounts are not specified, for the purposes indicated. For repaying the two above-named sums, sixty and twenty-five years are required. The provisions of the Board's Acts of 1902 and 1906 are to apply to the moneys authorized to be borrowed under the Act and the repayment thereof. The Bill contains a long clause providing for the protection of apparatus of the Board where it is affected by works of other undertakers. They seek power to require any local authority, and any gas, electricity supply, or water company, to give them three days' notice before digging any trench, tunnel, or heading for the purpose of laying down, constructing, repairing, or altering any sewer, drain, main, pipe, or other works, watercourse, &c., near to which there is any pipe or other apparatus belonging to the Board, and to comply with their reasonable requirements for protecting their apparatus from injury. The clause also provides, in default, for compensation for any loss or damage sustained, and penalties in addition. [*Parliamentary Agents: Messrs. Dyson and Co.*]

In a General Bill promoted by the Morley Corporation, a limitation is put upon the term "domestic purposes" in connection with water supply. It is laid down that it is not to include water for cattle or for horses; for washing horses, carriages, motor-cars, or other vehicles; for any trade, manufacture, or business; for washing house or shop fronts or windows, by means of a hose or jet; for watering gardens; or for fountains or any ornamental purposes. The Corporation ask for power to increase their water-rates with the sanction of the Local Government Board; to levy upon the owner instead of the occupier the water-rate in respect of property of the rateable value of £10 or less; to require a cistern or cisterns to be provided capable of storing an adequate supply of water to the premises for 48 hours; and to order the closing of polluted wells. The Corporation wish to be empowered to borrow, with the consent of the Local Government Board, such further money as may be necessary for any of the purposes of the Act or of the water undertaking. [*Parliamentary Agents: Messrs. Baker and Sons.*]

Authority is required by the Corporation of Northampton to construct additional works, and make better provision with regard to their water undertaking. The new works consist of an impounding reservoir upon the Stowe Brook, in the parishes of Guilsborough and Hollowell, a service reservoir to be constructed by the side of the existing Boughton reservoir, and three aqueducts (one of which will have a tunnel)—all to be completed within ten years. After the passing of the Bill, the water limits of the Corporation will be extended so as to include the parishes of Guilsborough, Coton, and Hollowell, in the rural district of Brixworth. Water supplied for domestic use is not to be employed for motor vehicles or for washing them. Power is required to borrow £141,139 for the construction of the reservoirs and the purchase of lands, and £48,861 for the aqueducts—to be repaid respectively in sixty and fifty years from the time of borrowing. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Pontypridd and Rhondda Joint Water Board require power to construct four additional aqueducts in the respective parishes of Llantrisant, Llanwonno, Merthyr Tydfil, Pontypridd, and Rhondda, for the completion of which they ask ten years. They wish for an extension of the period specified in the Act of 1910 for purchasing land and carrying out certain works. As soon as the Board shall have received a supply of water from the Corporation of Merthyr Tydfil under an agreement scheduled to the Bill, the fixed quantity referred to in section 59 of the above-named Act is to be delivered by them to the Llantrisant and Llantwit Fardre Rural District Council, and to be taken by the Council in the manner provided in the section. The Bill contains provisions in regard to the rates to be charged for a supply of water for domestic purposes and its sale by measure. Section 67 of the Act of 1910 bearing on the latter subject is to be repealed; and the Board ask to be relieved of the obligation to supply water by measure for any less sum than 10s. per quarter. Power is required to borrow £8877 for the purchase of land in connection with the works authorized, and £2226 for paying the costs incurred by the Board in opposing the Rhymney Valley Water Board Bill, 1911, and the Bill for the Merthyr Tydfil Corporation Water Act of that year. [*Parliamentary Agents: Messrs. Torr and Co.*]

A Bill has been promoted to authorize the transfer to the Southend Water Company of the western district water undertaking of the Rochford Rural District Council, and the extension of the Company's limits of supply so as to include a number of parishes in the rural district of Rochford, in the county of Essex. The works to be transferred consist of the well, pumping-station, and water-tower at South Benfleet, and all the mains and other plant, stock, and effects of the Council in connection with their water undertaking. The consideration to be paid to the Council is £20,372 (this being the aggregate amount of the balances of the loans which have been raised, and were outstanding on the 31st of March); and a sum equal to the actual cost to the Council of any additions to the plant which they, with the approval of the Managing-Director or other duly authorized officer of the Company, may have made between Nov. 12, 1912, and the date of the transfer. The Company take over the loan indebtedness of the Council, and retain so much of the purchase-money as will be required to pay off the instalments of the principal as they fall due—paying the balance in cash on the date of transfer, or interest upon it at the rate of 4 per cent. per annum until the payment takes place. The Rochford, Rayleigh, and Leigh Water Order will be repealed. The Council require permission to borrow such sum as may be necessary for defraying the cost of promoting the Bill, and they ask for the usual five years for its repayment. [*Parliamentary Agents: Messrs. Torr and Co.*]

In the Act obtained this session by the Swanage Gas and Water Company, provision was made for the sale of the water portion of their undertaking to the Urban District Council, if the latter should promote, in the next available session of Parliament, a Bill to obtain authority for the purchase. This has been done; and in the event of the required power being granted, the Council are, within three months after the passing of the Bill, to give the Company notice of their intention to buy. The purchase price is to be such as may be agreed upon or determined by arbitration, *plus* the expenses incurred by the Company in connection with the water portion of their Act, and those relating to the transfer and winding-up of the undertaking. The Council will purchase the movable goods of the Company, and pay compensation to any officers who may not be retained by them. The "water undertaking" of the Company means all the works, pumping-stations, reservoirs, plant, &c., existing on Dec. 25, 1913 (or, in the case of arbitration, the next usual quarter-day after the date of the award), and all contracts, and benefits of or liabilities under contracts, subsisting on that date, with certain specified exceptions. The limits of supply are to be the parish and urban district of Swanage, and the parish of Langton Matravers, in the county of Dorset; and the rates to be charged are 8s. 8d. where the rateable value of the premises does not exceed £12 per annum, and up to 8 per cent. above this figure. As soon, however, as the Council commence supplying water from the works authorized by the Company's Act of last year, the latter charge may be increased to 10 per cent. As is now usual, there will be extras for additional closets and for baths, and also for water used with a hose-pipe. The price of water supplied by measure will not exceed 1s. 6d. per 1000 gallons. Authority is sought to borrow such sums as may be necessary for the purchase of the undertaking and defraying the expenses of transfer, and for paying the cost of obtaining the Act; also £1000 for the supply of fittings and providing working capital. For repaying the money borrowed for the purchase, fifty-five years are required; for the £1000, ten years; for defraying the costs of the Act, five years. Provision is made for maintaining the undertaking by the Company until its transfer to the Council has been completed. [*Parliamentary Agents: Messrs. Martin and Co.*]

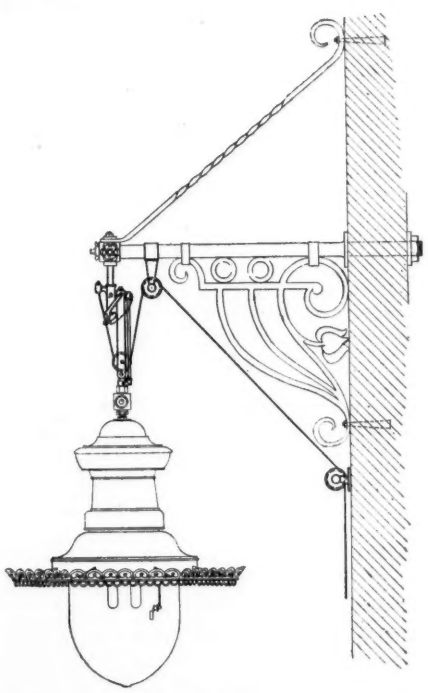
The Windermere District Gas and Water Act of the present session contains provisions for the transfer of the undertaking of the Windermere Gas and Water Company to the Urban District Council, who are promoting a Bill to enable them to carry out the purchase. The gas clauses of the measure were dealt with in the "JOURNAL" for the 28th ult. (p. 236). With regard to water, the Council require power to maintain the existing works and furnish a supply in the townships of Undermillbeck, Applethwaite, and Troutbeck, in the parish of Windermere. The rates to be charged are 2d. per week where the rateable value of the premises does not exceed £8 per annum; and above this, £7 10s. per cent. per annum. There will be the usual extras. The charge for measured supplies is not to exceed 1s. 6d. per 1000 gallons. Power is required to buy and sell water in bulk and supply fittings. For the purchase of the undertaking, the Council ask for authority to borrow such sum as may be necessary, £21,000 for the extension and improvement of the water-works, and, with the consent of the Local Government Board, any additional money needed. Sixty years are specified as the period the Council wish to be allowed for repayment of the amount borrowed for water-works extensions. [*Parliamentary Agents: Messrs. Speechly, Mumford, and Craig.*]

HIGH-PRESSURE LAMPS FOR ADVERTISING ON BUSINESS PREMISES.

Raising and Lowering Gear for High Positions.

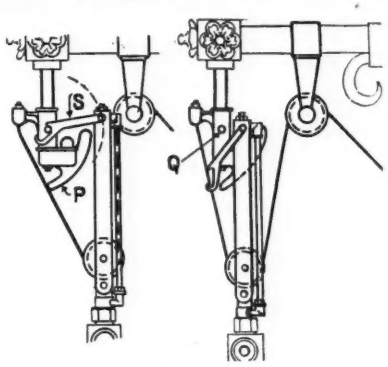
KEITH HIGH-PRESSURE LAMPS SUSPENDED FROM BRACKETS FROM THE TOP OF THE RONEO BUILDINGS.

In these days business is conducted at high pressure; and it is only consistent that, at any rate, the exterior artificial lighting of business premises should also be of the high-pressure kind. We have had very cogent illustrations that this lighting system has become, on account of its multiple merits, a first favourite with the owners of business establishments. Some world-known business premises have adopted the lamps for advertising purposes. Sandow's cocoa establishment, for example. And now the Keith light has displaced mercury vapour lamps at the upper part of the extensive "Roneo" office furniture premises in Holborn. There five of the 1500-candle power high-pressure lamps are fixed; being suspended from the top of the building in order to throw into relief at night time the front of the premises generally, and the name "Roneo" in particular. The lamps are situated between 60 and 70 feet from the pavement; and gas lighting from this position has been made possible by the use of Keith patent raising and lowering gear. The contract for the installation was secured by the Goswell Road branch of the Gaslight and Coke Company, to whose instructions the work was carried out by the James Keith and Blackman Company, Limited.



Lamp on Bracket Fitted with Raising and Lowering Gear.

The photograph merely gives a section of the elevation of the building to show the position of the lamps; and the second and third illustrations are sketches portraying how the Keith lamp is suspended from a bracket, and fitted with raising and lowering gear. These illustrations will perhaps convey more than words to our readers as to the method of fixing the raising and lowering gear from brackets. However, a few words of explanation may assist the illustration in elucidation. No flexible tubing is employed; but the arrangement permits a sound joint to be made while still allowing the lamp freedom to swing as on a ball joint. It is in reality a special form of cup-and-ball joint; the ball half being fixed to a hanger, and an inverted cup being fixed to a form of stirrup-piece attached to the top of a lamp. The lamp is raised and lowered by a single winch; but as provision has to be made to enable the lamp to be raised and lowered without the use of the Keith traversing arrangement, this entails the addition of a pair of levers S to the stirrup-piece. When the lamp is raised, the cup on the stirrup-piece comes in contact with an inclined prong P on the lower part of the hanger, which pushes it out of the centre as



An Enlarged View of the Gear.

it is raised. On being raised above the prong, the cup swings inwards to the centre exactly over the ball; so that, upon being lowered, it will drop on the ball, and make a gas-tight joint by its own weight. To lower the lamp, it is first raised until the ends of the two levers engage with a pair of pins Q fixed on the hanger in such a way that, on again lowering the lamp, these levers cause the upper portion of the stirrup, with the cup, to describe a radial path which clears the prong. The ball half of the joint is fitted with an automatic ball-valve, which closes by a spring as soon as the joint is broken, so that the lamp may be removed even if the high pressure is present up to the joint.

In the case of these lamps suspended from the top of the Roneo building, the winches are fixed in convenient positions inside the room opposite each lamp, so that a man can see the lamp connected and disconnected while he operates the winch. The lamps being 60 to 70 feet above ground level, this shows that to-day altitude is no obstacle to the use of high-pressure gas-lamps. As for the effect of the lighting, the photograph does not convey what is to be seen by a personal inspection of the lighting. The striking effect can, in reality, only be properly appreciated by inspection in the neighbourhood.

Coke-Oven Gas in Germany.

A far reaching scheme for supplying the Silesian Plain Land with gas from the mining district of Waldenburg is, according to the "Journal für Gasbeleuchtung," now being put into execution. The considerable gas production of the coke-ovens of the Fuchs Mine near Waldenburg is to be used. The surrounding communes will thus have the advantages of a cheap gas supply, without the necessity of building a gas-works. The long-distance mains are already laid as far as the Silesian Valley, and negotiations are in progress for their continuation as far as Schweidnitz.

VISIT TO THE COOMBS WOOD TUBE WORKS, AT HALESOWEN.

WORK was in full swing in the large shops of the Coombs Wood Tube Works of Messrs. Stewarts and Lloyds, Limited, at Halesowen, last Thursday afternoon, when a visit was paid to them by the members of the Midland Association of Gas Engineers and Managers. Extensive users of tubes and pipes of all descriptions as many of them are, there were some of the visitors who had not before seen the making of wrought iron and steel tubes. Here they were able to indulge their thirst for knowledge to the fullest extent by the kindness of the firm, and the information given to them by their courteous guides. The visitors were first met by Mr. T. E. Upjohn; and then Mr. R. H. Krause, the Works Director, greeted them, together with various members of the works' technical staff. The large company was divided into small parties, and placed in charge of a guide, in order that information might be afforded regarding the processes which were to be inspected. It should be prefaced that the works cover an area of about 26 acres; but at Glasgow Messrs. Stewarts and Lloyds have another extensive establishment. In all, the firm employ round about 10,000 hands, of whom between 3000 and 4000 are engaged at the Coombs Wood works.

Fortunate was the writer in being with the President's party in making a survey of the huge establishment, as Mr. Krause and Mr. Upjohn took it under their joint care. At these works, it was learned that wrought iron and steel tubes (no cast-iron work is done here) are made for all purposes from ⅛-inch up to 48-inch in diameter, as well as pipe connections of all kinds, and parts required for machinery—for instance, some large cylinders were seen for Diesel oil-engines which are to be installed in a power station in a remote part of the world. The character of the work carried on in the shops is as extensively varied as are the world-wide destinations of goods sent from them. The times are very busy ones in the engineering world; and it was seen that the demand for the productions of Messrs. Stewarts and Lloyds is such that they are working at very high pressure. There is no doubt there will be seen ere long an extension of the premises for coping with requirements.

In going round the place (it was, of course, impossible to do more than make a rapid survey of part of it), there were two things that especially struck the writer. The first was the large extent to which the craftsman has been preserved in this business against the inroads of machinery; and the second one the elaborate inspection to which the productions of the firm are subjected during the various stages of production, and finally before they are allowed to leave the place. We passed first into the shops in which the forging of fittings was going on. It was a busy place. The incandescent fires of the forges glimmered, as we entered at one end, through a long perspective. Stopping before various of the forges, we saw the flat pieces of incandescent metal turned, by the aid of hammers, deftly and quickly, into elbow pieces and connections of all sorts and sizes—regular and irregular in shape, according to purpose. There is skill in this work. It is work in which no machine has yet been able to compete with man's hands and brains. The skill and interest displayed by the men made one feel that, for the sake of such adeptness and interest, it would be almost a matter of regret if an inventor some day succeeded where others have failed. The men work on piece; and they earn good money. Their skill and interest are their capital; and there is individual responsibility. The men's work bears their own mark; and any defective article has to be made good.

It was an interesting tour that was made of this particular shop; and then we went on to the department where the work of making the screw-threads of the smaller sockets and fittings was proceeding. There boys look after the machines, and each boy has two or three taps under his care. In a shop overhead was seen the screwing of the larger fittings. There are a considerable number of machines engaged in this work; and some of them are multiple ones—in cases having as many as six taps going at once. The care taken to ensure true threads was evident from the work and the subsequent individual examination that was going on. There is also hydraulic testing for tightness. It was noticed that the firm, under their present style, retain the old trade mark of "L & L."

By the way, speaking of connections, great interest was shown in the patent joint invented by Mr. S. R. Barrett, of Birmingham, for high-pressure tube work. There is no question that Mr. Barrett has produced a joint (which Messrs. Stewarts and Lloyds are making) that will stand well. He uses an internal brass nipple inside a connecting-piece. The brass nipple has centrally a projection so that an annular space is formed on each side between the thread of the connecting-piece and the nipple. A lead washer is placed at both ends of the nipple; and thus, when the pipes to be connected are screwed tightly up into the connecting-piece, the lead is jammed into the thread, and an absolutely tight joint is secured. One of the joints was seen that had been tested up to 1000 lbs. per square inch water pressure. The joint attracted much attention; and we shall expect to hear more about it outside Birmingham. While speaking of high-pressure work, the firm it was seen are very busy meeting the demand for steel tubes for all high-pressure work—gas, steam, &c.—and in all sizes. They have in their time supplied thousands of miles of high-pressure tubes; and with the growth of high pressures in gas distribution, they are anticipating doing a more extensive business still. At Coombs Wood works, the larger sizes of high-pressure tubes are made and minor sizes at the Glasgow establishment. A large stack of high-pressure gas tubes was to be seen ready for dispatch to the Helm Lamp Company of Nuneaton; and these had been tested up to 100 lbs. per square inch. Mr. George Helps informed the writer that the tubes are going to be joined together by oxy-acetylene welding.

The several parties wandered through extensive stores of fittings of all kinds—from small to large sizes of every describable part that is wanted in connection with pipe work. They also passed through the shops where tubes of varied diameters were in process of production; and they saw the producer-gas heated furnaces. They witnessed tubes being made from strip to finish, and their coating with preservatives. All the tubes are tested by hydraulic pressure—generally to 100 lbs. pressure; but this is varied according to quality. They are also hammered. In fact, every precaution is taken to ensure sound pipes leaving the works. Every tube, too, is looked through to see that there are no impediments remaining. The visitors saw stacks of tubes of all diameters in the stores waiting for dispatch by canal; the works having no railway siding. In all the shops and warehouses where the heavier goods are dealt with, transport is by overhead electric tramways.

Having made a perambulation of the flange department, a hurried visit was paid to the welding section, where both gas welding and electric welding were proceeding. For inspecting the latter the visitors were armed with coloured glass hand screens. It was a beautiful sight to see the intense white heat and the metal brought to melting-point almost immediately there was application. The Diesel engine cylinders to which reference has been already made were electrically welded, and they were tested to 2000 lbs. per square inch. The firm have their own electricity generating station.

It was impossible before the men left work to make much more than a cursory examination of the processes in part of the many-acred establishment. One could spend much time profitably at such works, and gain knowledge the whole time. However, the visitors were highly interested, and left the works with feelings of indebtedness to those who had permitted the inspection, and to those who had intensified the interest by the information imparted—an indebtedness that was expressed by word and act at the subsequent tea at the Grand Hotel, Birmingham, as recorded at the end of the report of the proceedings at the ordinary meeting of the Association.

YORKSHIRE JUNIOR GAS ASSOCIATION.

The full and varied "bill of fare" provided brought together an exceptionally large attendance of the members at the meeting held at the Leeds Institute on Saturday. The chair was occupied by Mr. C. T. B. ROPER, the Senior Vice-President.

The first item on the programme was the Presidential Address of Mr. W. Walker Atley. This is, however, held over until next week, as the necessary diagram and illustration did not come to hand in time for inclusion in the present issue.

After this came a paper on "Shop-Lighting: High and Low Pressure," by Mr. W. Dawes (of Castleford). This, with a report of the discussion, will be found on pp. 543-5.

The final item was a lucid explanation of the Holophane Lumeter, by Mr. A. Edwards, the Chief Chemist at the Leeds Gas-Works. Actual tests were taken, and the uses to which the instrument might be put in the way of testing lamps, surface brightness of walls, absorption of light by various colours of wall papers, general street illumination, &c., were explained.

Cordially accorded votes of thanks to the three speakers brought the meeting to a close.

German Association of Gas and Water Engineers.

It is announced that the fifty-fourth annual general meeting of this Association will be held at Strasburg, from Monday the 23rd to Friday the 27th of June next, under the presidency of Herr F. Reese, the Manager of the Dortmund Water-Works. Technical proceedings will be confined to the three mid-week days—24th, 25th, and 26th of June.

Decisions under the National Health Insurance Act.—In a letter addressed to the Secretary of the Institution of Gas Engineers by Mr. R. W. Edwards, the General Manager and Secretary of the Aldershot Gas, Water, and District Lighting Company, calling attention to two decisions by the Umpire, under Part II. of the National Health Insurance Act, and given in the "JOURNAL" for the 14th ult., he made the suggestion that, as there have been so many decisions affecting gas undertakings, a detailed list of them should be prepared by the Committee of the Institution, and be available for the use of the members on application. Mr. Edwards has received a reply to the effect that the subject was brought before the Parliamentary Committee of the Institution, and that it is proposed to issue with the annual report a list such as that suggested by him.

THE WOLVERHAMPTON GAS-WORKS.

Visit by the Midland Junior Gas Association.

GENERAL VIEW OF THE WOLVERHAMPTON GAS-WORKS.

(Before the Installation of the Telpher.)

On Saturday afternoon, the members of the Association, numbering nearly fifty, paid a visit to the works of the Wolverhampton Gas Company. The party were met at the low-level station by Mr. E. H. Wright, Works Chemist, a member of the Association, and proceeded to the Bushbury Works by tramcar. At the works the members were joined by the President, Mr. F. Shewring (of Droitwich), and were received by Mr. P. G. Winstanley, the Engineer and Manager, and an honorary member of the Association, Mr. A. H. Cranmer, Works Superintendent, also a member of the Association, and Mr. G. Kendall, the Assistant Superintendent. Mr. Winstanley and his assistants then conducted the members round the works.

Wolverhampton is supplied with gas—and well supplied—by a Company, which has been in existence for a great number of years. As a matter of fact, the date of its formation was 1820; and the town was first lighted in the following year—so that there will soon be a centenary to celebrate in this part of the world. The original works were at Horseley Fields, but in course of time the manufacture of gas there ceased. In 1849, new works at Stafford Road were completed. These occupied about 5 acres; and, with the old works already mentioned, supplied the Company's area for many years. These works were on a convenient site, on one side of the Birmingham Canal. But as time went on, of course, the business grew, and the works had to grow with it; and thus it came about that an additional works was built on 9 acres of land on the opposite side of the canal, in the parish of Bushbury. In this new works all the coal gas is now manufactured; the retort-houses on the old site having been dismantled.

Leaving the entrance gate, the old site is traversed, until the canal is reached, when a bridge is crossed over, which affords railway and other communication between the two sites. From this bridge an excellent view is obtained of the new works, and the fact is made apparent that everything has been arranged with a view to providing plenty of room. The large yard space allows ample accommodation for the storage of coal, in addition to the closed-in stores; and nowhere is there any suggestion of cramping in connection with the various buildings. Speaking of coal storage, it may be remarked that one of the old retort-houses has been put to this use. There are, too, another 15 acres of land adjoining which is available for extensions, when required. In addition to the Birmingham Canal (for which a private basin capable of holding six barges has been constructed), two railways are connected with the works—the Great Western and London and North-Western—and the Gas Company have two locomotives, to do the hauling on the excellent sidings through the works. The bulk of the coke and all the tar and liquor are removed by way of the canal.

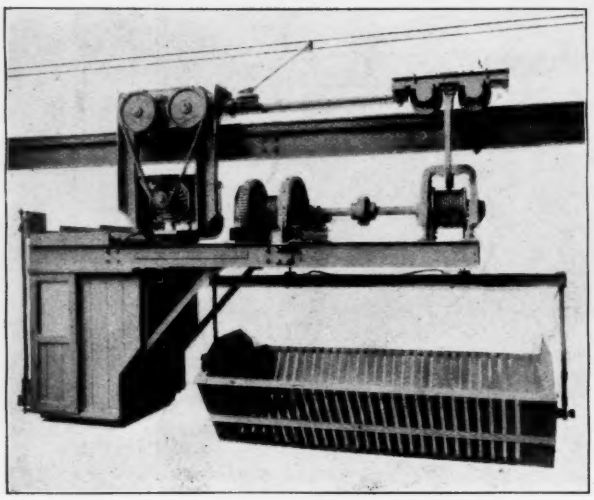
Proceeding to inspect the new works—which were built in 1898, to the designs of Mr. George Winstanley (then of Coventry), and a full description of which was given in the "Journal" for Oct. 31, 1899—the retort-house may be taken first. Here there are four sections of settings, each of which contains six beds of eight inclined retorts. The settings are heated by Winstanley's regenerator furnaces, and are arranged on both sides of the house, with the charging-floor running between. When these are all in work, they are equal to an output of about 2¾ million cubic feet of gas per day; and it may be remarked that this new section of the works forms a complete unit of itself. Everything was designed in proportion to the retort-house; and when any extension is made there, it will be necessary at the same time to add to the remainder of the plant. Running the whole length of the retort-house, on the side of the railway connection, is a well-arranged coal-store, which will hold over 3000 tons. An overhead railway passes down the centre, so that the waggons can be brought in from the main lines and discharged at any desired point. Provision is also made by means of which coal can be discharged straight from trucks on the railway sidings on to a table conveyor, which takes it to the crusher. There are two coal-breakers, from which the coal is elevated to two large storage tanks, holding about 120 tons, which are situated between the rows of settings—the house being supplied with coal on the central storage system. An advantage of this arrangement is the large amount of air-space which it gives in the retort-house. From the central storage tanks, the coal is run as required into small charging-trucks, travelling on rails above the settings, and each holding a charge for two retorts. These trucks are moved along as desired; the coal being fed into the retorts by means of shoots. Everything about the retort-house works to the complete satisfaction of the Engineer, who is exceedingly well satisfied with the results obtained; while the visitor is struck with the absence of trying working conditions. In connection with the crushing of the coal, it is noticed that Mr. Winstanley has a sprinkler fitted over the breaker. When the coal is in a dry condition, he finds it an advantage to keep down the dust by dropping water on it as it is being broken. The coal-breakers and elevators are worked by gas-engines.

A Mono-Rail Electric Telpher Installation.

Since the erection of the works, an important alteration has been made in the matter of the removal of the coke from the retort-house. About eighteen months ago, a complete mono-rail electric telpher plant was installed by Messrs. Strachan and Henshaw, Limited, of Bristol (their sub-contractors for the track being Messrs. Gibbons Bros., Limited, of Dudley). The telpher runs completely round the inside of the retort-house, as well as round the yard, and projects over the canal basin at one end for loading coke into boats. The track is a continuous one, 1020 feet in length and 29 feet above the yard level. The coke, as it is discharged from the retorts, runs into skips which are placed on the drawing-stage immediately under the mouthpieces. The hot coke is sprayed as it drops into the skips; and the skips, when full, are lifted by the telpher, run outside the retort-house, and thoroughly quenched by immersion in water tanks. There are two tanks provided for this latter purpose. The telpher then carries the skip to any point in the coke-yard where it is desired to place the coke; and the skip is there tipped at any height—which may be varied at will—by the telpher driver from within the cabin.

The skips are balanced so as to be self-tipping when full and self-righting and self-locking when empty; and they are of heavy lattice-bar construction. There are two telpher machines, both of which are capable of dealing with the hot-coke tipping-skips or

the bottom-opening skips for loading the barges. The discharge from the bottom-opening skips is so arranged that it is found there is practically no breakage of the coke. In fact, the skips may be discharged without giving the coke any fall. The telphers are of Messrs. Strachan and Henshaw's latest improved design, with free-swivelling bogie-wheel trucks, which are specially suitable for negotiating very sharp bends in the track. The wheels are of manganese steel, with the axles mounted in roller bearings.

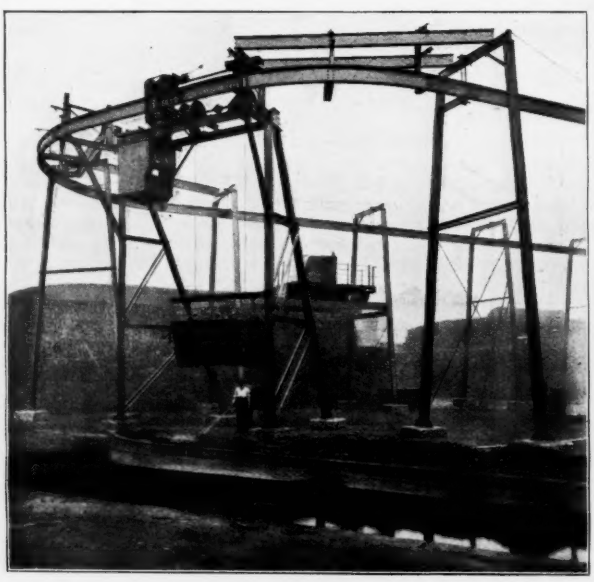


The Mono-Rail Electric Telpher.

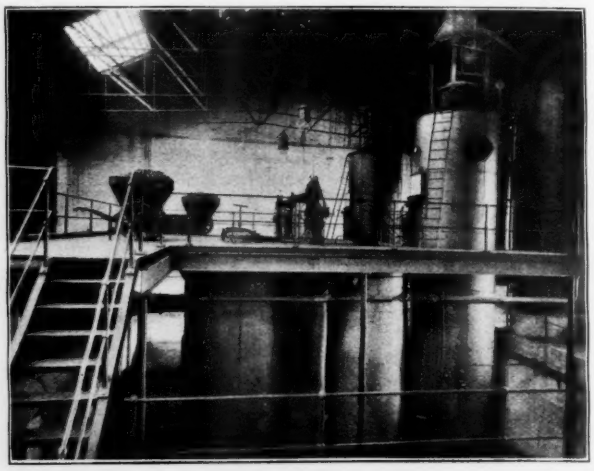
The direct-lifting arrangement of the hoisting gear adopted in these machines gives a very high efficiency, and has increased the life of the lifting ropes very considerably. The question of rope renewals—where hot coke was being dealt with—was formerly an important item in the maintenance bill. In these machines, however, the cost of rope renewals has been reduced to almost a negligible amount. The whole of the frame and the wheel-trucks and their connections are built of mild steel; no castings whatever being used in their construction. This obviates any accident which might otherwise result from a sudden shock, if castings were used for supporting any part of the gear.

Another important feature of the plant is the provision made for weighing the coke *en route* to the barges. The weighing is done by one of Avery's automatic recording and totalizing machines, which is so arranged that only the net weight of coke in the skip is weighed. The loaded skips are carried by the telpher to the weigher—the telpher pausing while the coke is weighed and totalized without disconnecting the skip. The weight of telpher and skip does not affect the weighing in any way. This is, we believe, the first gas-works to use an automatic weigher in conjunction with telpherage in such a way as to record the net load carried without detaching the skip from the telpher machine. Several other telpher plants with auto-weighers are, we understand, now being installed by the same firm.

The electricity generating plant in connection with the telpher system is fitted in the exhauster-house, and is in duplicate. It



Telpher Loading Coke into Barges on the Canal.

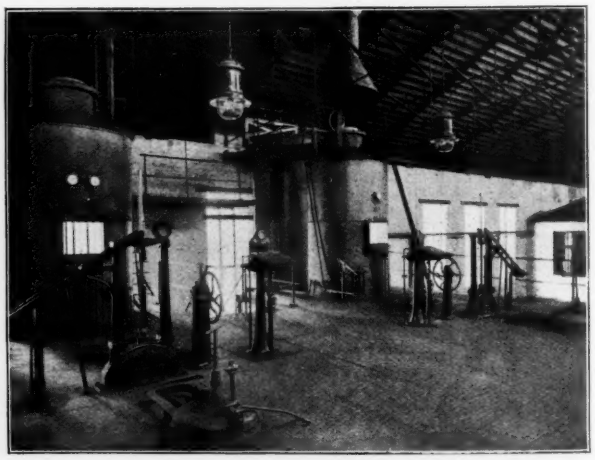


Humphreys and Glasgow Water-Gas Sets.

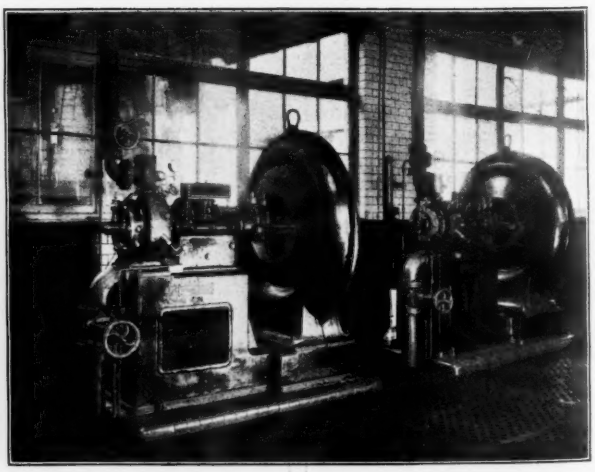
is suitable for supplying current at 220 volts for the two 30 cwt. (gross lifting capacity) electric telphers working continuously on maximum load. One of the "National" gas-engines is 36 B.H.P., and the other 39 B.H.P. Coupled direct to each engine there is a dynamo made by the Electric Construction Company. The hoisting speed is 50 feet per minute, and the travelling speed 500 feet per minute.

Carburetted Water-Gas Plant.

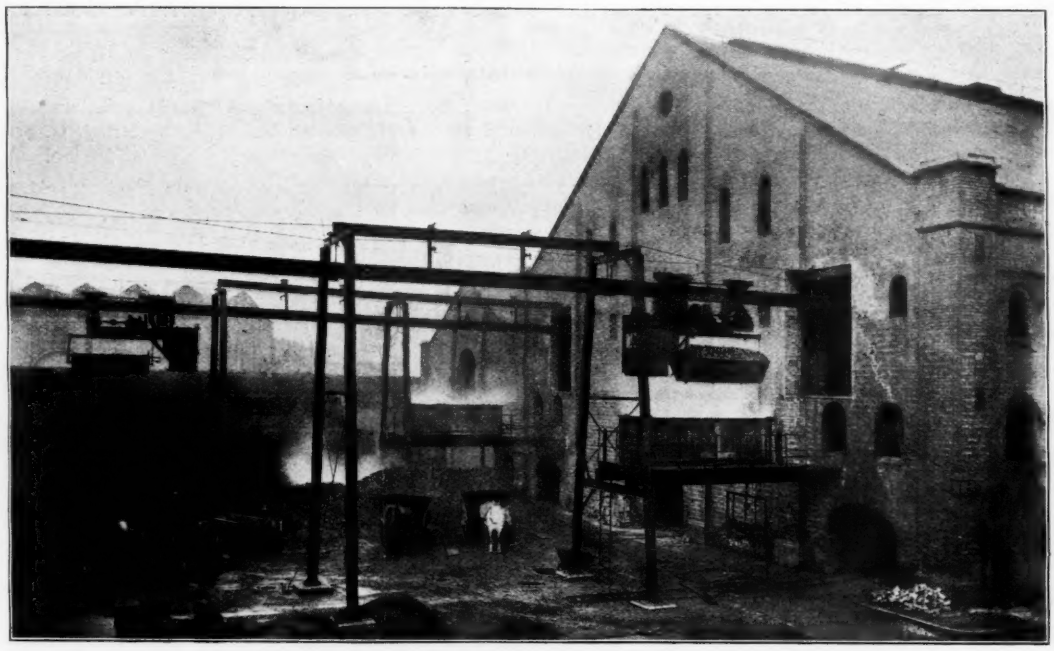
On the old works, and in a building originally used as a retort-house, first-rate accommodation has been found for two sets of Messrs. Humphreys and Glasgow's carburetted water-gas plant, each of a capacity of 750,000 cubic feet a day. Where this plant stands, five beds of regenerators were taken out; and the cellar was utilized. Thus the whole of the plant is in full view at one time—as will be seen from one of the photographs. Coke is



Water-Gas Installation—Charging Floor.



Steam-Turbines and Blowers for the Water-Gas Plant.



VIEW OF THE RETORT-HOUSE END AND TELPHER INSTALLATION.
(Showing the Track, the Quenching Tanks, and the Telphers.)

loaded up by the telpher into trucks, which are then shunted on rails running alongside the water-gas sets. The coke is then discharged into buggies, which are taken up by a lift to the charging-floor, after being weighed. The two steam-boilers, each 26 feet by 6 ft. 6 in., are fitted with Goodrich and Hamlyn's "Simoon" furnaces, and feed-water regulators for keeping the water-level constant. Near by is the machinery-room, in which are to be seen duplicate sets of blowers driven by De Laval steam-turbines of 30 B.H.P. There is an absolutely separate plant for the carburetted water gas, right through to the gasholders; so that the Engineer knows exactly what is being done. Lime is used for purifying the water gas; there being for this purpose three purifiers 40 feet by 20 feet—two of which were originally used for coal gas, while the third was added specially for the water gas. There are two sets of rotary exhausters each passing 40,000 cubic feet per hour; and the gas is measured through a station-meter which was in use formerly for the old coal-gas plant. There is an oil-storage tank of a capacity of 110,000 gallons.

Coal Gas Purifiers and Condensers.

To return now to the coal-gas plant, the gas as it leaves the retort-house passes to a set of annular condensers of six tubes, each 40 feet by 4 ft. 6 in. by 3 ft. 9 in., and a set of water-cooled condensers to deal with 2½ million cubic feet per day. There is a separator, also capable of dealing with the tar and liquor from the latter quantity of gas, and, in addition to a tar well and a liquor well, there is an overhead tar and liquor tank of a capacity of 13,000 gallons. The tar, fresh water, and liquor pumps are all under one roof. There is a well on the works, and a tank of 27,000 gallons capacity; while water is also taken from the canal, and for the locomotives from the town mains. Steam is obtained by means of two Lancashire boilers 28 feet by 7 feet; and more than a passing glance is deserved by the two 100,000 cubic feet per hour sets of reciprocating exhausters by Messrs. R. & J. Dempster. The Livesey washer and the two tower scrubbers (70 feet by 13 ft. 4 in.) are equal to dealing with 3 million cubic feet of gas per day; while for cyanogen extraction there is a rotary washer 21 ft. 2 in. by 9 ft. 6 in.

Oxide is used in the six purifiers, which are 30 feet square by 6 feet deep, arranged in line, in an open shed, with oxide revivifying floor overhead. For lifting the oxide from the boxes a friction-hoist operated by a gas-engine is employed; while the revivified oxide is run into the boxes by means of canvas shoots connected with openings in the overhead floor. The 100,000 cubic feet per hour station-meter is by the Gas-Meter Company, and is housed in a building in which there is room for another. Five holders, having a total storage capacity of 2,800,000 cubic feet, are provided; and between the general inlet and outlet mains to the holders, there is fixed a 24-inch Parkinson and Cowan safety governor. In the event of a gasholder-valve being shut by mistake, this valve at once comes into action. Speaking of the gasholders, a moment's pause may be made to recall the fact that it was from the Wolverhampton Gas-Works that Messrs. Glaisher and Coxwell made their world-renowned balloon ascent in 1862; the balloon being filled on ground adjoining the holders. This is supposed to have been the highest ascent ever made.

A further item of interest on the works—and in the same building as the carburetted water-gas plant—is a room containing two sets of gas-compressors, each designed to deliver 8000 cubic feet of gas per hour against a pressure of 5 lbs. per square inch five miles away. This little installation has been put down quite recently to supply a village at the distance named from the works, to which a 4-inch Mannesmann steel main has been laid. Reducing-governors are employed to bring the pressure down to 3 inches, at which the gas is distributed.

The shops, mess-room, &c., are all on an adequate scale; and by the entrance to the works, on one side, is a governor-room containing three Parkinson and Cowan double-cone governors, and on the other side are a weighing-office, photometer-room, and laboratory.

A Vote of Thanks.

When the members returned from their tour round the works, tea was kindly provided by Mr. Winstanley, after which

The President proposed a hearty vote of thanks to Mr. Winstanley and his assistants for their kindness. He said it was impossible in the time at his disposal to mention all the many points worthy of notice; but the various portions of the plant had been of great interest to the members. He had been particularly impressed by the general cleanliness of the works and the very neat appearance of the coal-stores. The members were much indebted to Mr. Winstanley for giving them so much of his time, and also for his hospitality.

Mr. C. C. Barber seconded, and said Mr. Winstanley had remarked to him, while going round the works, that he was afraid they had "nothing fresh" to show the members; but they had seen a very good example of how a gas-works could be kept. He wished to endorse the President's remarks as to the cleanliness and general order evident everywhere throughout the works.

The vote having been heartily accorded,

Mr. Winstanley thanked the members, and said that it had given him and his assistants much pleasure to show them round; and any efforts upon their part had been amply repaid, if the members had derived pleasure from what they had seen.

Mr. Cranmer also said it had been a pleasure to him to show his fellow-members round.

Society of Engineers.—At a meeting of the Society to be held next Monday, at the Institution of Electrical Engineers, Victoria Embankment, Mr. Arthur Valon, the President for 1913, will deliver his Inaugural Address.

Mr. F. W. Goodenough on Coal Gas as a Fuel.—As already announced, Mr. F. W. Goodenough, the Controller of Sales of the Gaslight and Coke Company, will give two Cantor Lectures at the Royal Society of Arts on "Coal Gas as a Fuel for Domestic Purposes." The first will be given next Monday, when the lecturer will consider the substitution of gaseous for solid fuel in the home from the points of view of public health, personal health and comfort, and domestic economics and labour-saving. He will trace the evolution of the gas-fire, combat the prejudices against it, compare the open fire with other systems of heating, and deal with radiant and convected heat and the relation of heating to ventilation. In the second lecture, to be delivered on the 10th prox., he will take up the following subjects: Gaseous fuel for cooking purposes; the question of hot-water supply; the various types of gas water-heaters; the instantaneous, storage, and circulating systems of hot-water supply; and miscellaneous domestic applications of gaseous fuel.

GAS MANUFACTURE, GAS-WORKS CONSTRUCTION, AND MANAGEMENT.

By J. G. NEWBIGGING, M.Inst.C.E.

THE last number of the "JOURNAL" contained an abstract of the first of two lectures on "Gas Manufacture, Gas-Works Construction, and Management," delivered at the Manchester University by Mr. J. G. Newbigging, M.Inst.C.E., the Corporation Gas Engineer. The following is an outline of the second lecture, in which the manufacture of water gas and the construction and arrangement of the purifying, storing, and distributing plant were dealt with.

CONDENSING, EXHAUSTING, AND PURIFYING PLANT.

The lecturer began by tracing the progress of the gas from the retorts to the hydraulic main (the function of which he explained), then to the foul main, and afterwards to the condenser, and explained that in its travel its temperature was lowered from 129°, 160°, or 180° Fahr. to about 60° Fahr. The atmospheric and water-tube systems of condensation—the former requiring 10 square feet and the latter only 3 square feet of surface per 1000 cubic feet of gas—were described. Next came a reference to the functions and action of the exhauster. Though up to this point the gas would have deposited from 9 to 11 gallons of tar and from 11 to 12 gallons of water per ton of coal carbonized, as well as some ammonia and carbonic acid, Mr. Newbigging pointed out that it was still in a very impure state; and the next piece of apparatus through which it passed was the tar-extractor. He showed a model of a Pelouze and Audouin apparatus, and said the gas, on its exit therefrom, should be practically free from tar. The extraction of the ammonia, carbonic acid, and sulphuretted hydrogen had next to be taken in hand; and the appliances used in the operation were explained—a model of one of Holmes's scrubber-washers being exhibited. As the gas leaves the washer it should be free from ammonia; and it is next purified from sulphuretted hydrogen by sending it through hydrated oxide of iron. With the exception of a small quantity of sulphur as bisulphide of carbon and organic sulphur, the gas is now ready for use. From the purifiers it passes to the station meter, where the quantity made is registered, and thence into the gasholder.

WATER-GAS MANUFACTURE.

Mr. Newbigging explained that until recent years it was necessary, owing to the high illuminating power standards then prevailing, to enrich coal gas by means of cannel. But as the supply of this material was limited, the price became prohibitive; and gas engineers began to look round for some substitute. Carburetted water-gas plants were introduced, and adopted in many works, as it was found that the cost of enrichment by this means was only about 0·5d. per candle per 1000 cubic feet, compared with 1d. for cannel or benzol. In addition to its value as an enriching medium, water-gas plant possesses the advantages of occupying small ground space, being rapidly brought into, or thrown out of, use, and rendering a manager practically independent of labour. The units range from 100,000 to 1,500,000 cubic feet daily capacity; and the labour of five men, of whom only two need be trained, is amply sufficient to operate plant of the last-named size. The lecturer explained the process of making water gas, and showed on the screen the complete apparatus—consisting of a generator, carburettor, superheater, oil heater, washer or seal scrubber, and condenser. He concluded this part of his lecture by giving the following table showing the composition of carburetted water gas and coal gas:

	Carburetted Water Gas. Per Cent.		Coal Gas. Per Cent.
$CO_2 + H_2S$	3·8	..	1·80
O	*nil*	..	0·10
C_nH_{2n}	14·6	..	4·30
CO	28·0	..	7·00
H	35·6	..	48·34
CH_4	17·0	..	34·00
N	1·0	..	4·46

The specific gravity of carburetted water gas is ·5 to ·54; that of coal gas, ·43 to ·46.

THE GASHOLDER AND TANK.

Having produced, purified, and measured the gas, Mr. Newbigging proceeded to deal with its storage. He remarked that, from an engineering point of view, the gasholder and tank, when they are constructed of large dimensions—as in the case of the new holder at Bradford Road, Manchester, a view of which was given in the "JOURNAL" for Aug. 20 last (p. 500)—are the most important structures in gas-works. The storage capacity should be equal to one day's maximum consumption; and if it is 50 per cent. more, so much the better, as ample storage gives a feeling of security to the officials in time of fog, and conduces to good regular working. It also enables the gas-producing plant to be let down for a part of Sunday.

Taking the holder just referred to as an example, the lecturer described in great detail its construction and that of the tank containing it. He pointed out that the construction of a gasholder tank requires the greatest accuracy combined with the best materials; and the circular form of the structure must be correctly maintained, or difficulty will be found with the working of the holder in it. The number of bricks used in the construction of the tank wall was 4 million; and the quantity of water required to fill the tank was 9,042,018 gallons, or 40,366 tons. The forces and resistances to be dealt with when designing a tank of this character are, on the one side, the pressure of the water; and, on the other (1) the resistance of the earth backing, (2) resistance due to the weight of the wall, and (3) resistance due to the cohesion of the material. For stability and a reasonable margin of safety, and to ensure a light tank, the last three items added together must greatly exceed the pressure of water.

In the case of the holder, too, the greatest care has to be exercised in designing and calculating the various parts of the vessel, so that they will resist the forces acting upon it. The top curb is subjected to very great compound stress, and must therefore be very rigid, so that no distortion may take place in a high wind when the holder is fully inflated. The forces acting upon the curb are: (1) The pull of the sheets caused by the pressure of the gas on the under side of the crown; (2) the wind pressure acting horizontally on the side sheets and transmitted to the curb; (3) the weight of the side sheets and framework acting in a downward direction; and (4) the pressure of gas on the side sheets from within acting in a horizontal direction. The resultant of these forces is found to cause compression on the curb, which would therefore fail by buckling or compression. In the Manchester holder, the stress works out to 6 tons per square inch on the curb, which Mr. Newbigging considers a safe working stress. As there is always a tendency for a curb to buckle, it is well to keep the stress low. The total pressure given by the four lifts of the holder is equal to a column of water 11 inches high, or only 0·4 lb. per square inch. The lecturer showed, by means of lantern views, the progress of construction of the tank and holder.

DISTRIBUTING PLANT.

Having followed the progress of gas in its production, purification, and storage, Mr. Newbigging passed on to deal with its distribution, which he said was of equal importance to extracting from the coal the whole of the gas that is of value for illuminating purposes, and depositing it in a purified condition in the holders. At the outset, he laid stress upon the necessity for having in all works, whether large or small, a governor to control the pressure of the gas as it goes out to supply the town or district. Then the mains and pipes should be of good metal, well jointed, of adequate size, and laid at a sufficient depth (a minimum of 24 inches) to protect them from heavy traffic. The attention which has been given to these matters has led to a marked improvement in the average amount of leakage occurring in the distribution of gas. Twenty to thirty years ago, the gas unaccounted for throughout the country averaged nearly 20 per cent. of the make; now the average is not much more than 7 or 8 per cent. In Manchester, there are nearly 1000 miles of mains, the greater portion of which have turned and bored joints, which Mr. Newbigging prefers, both for ease in adjustment, economy, and efficiency; and he thinks the fact that his leakage is only 4 per cent. speaks well for the adoption of this form of joint. This proportion of the make of gas in Manchester is equal to 240 million cubic feet, which at 2s. per 1000 cubic feet comes to £24,000. High-pressure distribution, which has come into prominence in recent years, augments the illuminating value of the gas two or three times, and increases its efficiency for heating and industrial purposes. For the transmission of gas to long distances the high-pressure system has many advantages. For example, at 4 inches water pressure, a 6-inch main will discharge at a distance of a mile 8500 cubic feet of gas per hour; whereas the same size main with a pressure of 15 lbs. per square inch, will discharge 72,000 cubic feet, or nearly nine times the quantity. In outlying districts, therefore, where the consumption of gas has rapidly increased, it has been found more economical and efficient, in some circumstances, to lay a high-pressure main to boost-up the pressure in the existing mains, than to provide new and larger pipes. In such cases, steel mains are used with a rigid joint, a diagram of which was shown.

RESIDUAL PRODUCTS.

The lecturer next dealt with the necessity for the gas engineer doing all in his power to promote the interests of the undertaking in his charge by utilizing to the utmost extent the residual products of gas manufacture. He said it was a remarkable fact that in properly conducted gas-works there are no waste products. There was not time to go into the details of the manufacture of sulphate of ammonia and sulphuric acid and the distillation of tar. But Mr. Newbigging directed the attention of his audience to the circumstance that in the majority of gas-works, even the smallest, sulphate of ammonia—one of the most powerful fertilizers known to science—is manufactured. In Manchester, 4300 tons per annum are produced; and the present price, free on rails,

is £13 10s. per ton. They do not at present distil tar; but this is in contemplation.

Future of the Gas Industry.

Mr. Newbigging closed his lecture with a few observations on this subject. Having quoted statistics to show the progress of the industry, he said there was no denying the existence of a tendency to substitute electricity for gas in many cases where handiness in lighting and extinguishing, and decorative effect were required. The consequence was that the lighting load of gas undertakings was now of slow growth, and they had to look for other outlets for the sale of their product. In saying this, however, he was not prepared to admit that electricity could claim all the advantages of artificial lighting, and leave none to the credit of gas. But even if it were conceded that gas has not a promising outlook in the future for lighting, it certainly has an unlimited field for heating and cooking, and this without any serious competitor except coal. Referring to the present method of burning this fuel, and the resulting wilful waste of its valuable products, Mr. Newbigging said:

> Let us consider for a moment what this waste amounts to in Manchester. It has been estimated that the consumption of solid fuel for household purposes in the city is from 700,000 to 800,000 tons per annum—mainly bituminous coal. If all this smoke-yielding material was replaced by gaseous fuel, what a change would be effected in the atmospheric conditions of Manchester. The value of this 800,000 tons of coal may be fairly estimated at £800,000; but that of the products lost—viz., gas, coke, tar, and ammonia—is, at a low computation, £1,100,000. So that if we take the difference between the prime cost of the coal and the value of the products, there is left £300,000 per annum as absolute waste in burning the coal in open fires as compared with distillation at the gas-works. This sum added to the corresponding waste in the other cities and towns of the United Kingdom would represent an enormous amount difficult to realize; and this is apart from the cost of the damage done to buildings and in other directions by smoke and fog, which I do not attempt to compute. We are continually bewailing the nearness of the exhaustion of our coal supply, and picturing to ourselves the terrible calamities that will befall us in consequence; and still we complacently tolerate this waste, which can be lessened by an abundant supply of cheap gaseous fuel. In not utilizing our present sources of heat and power in the most advantageous way, we are not only injuring ourselves but future generations as well.

Mr. Newbigging submitted that nothing should be allowed to stand in the way of a supply of cheap gas, and that facilities should be given to the citizen to obtain efficient apparatus for its consumption, so that he might be encouraged to substitute gaseous for smoky solid fuel, which would at least mitigate the disagreeableness of the fogs such as they had recently been experiencing in Manchester.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

A Lecture by Mr. Jacques Abady.

There was a large attendance of members of the London and Southern District Junior Gas Association at Westminster Technical Institute, Vincent Square, S.W., last Friday evening, when Mr. Jacques Abady fulfilled a promise he had made to deliver a lecture on "Gas Testing Instruments—with Some Suggestions, Old and New." The chair was occupied by the President (Mr. D. J. Winslow, of Lea Bridge).

In opening, Mr. Abady remarked that if he had been delivering a lecture on gas-testing instruments five or six years ago, he thought that possibly what would have been uppermost in the minds of himself and those present—and what therefore they would have been talking about or listening to—would have been the question of testing gas for illuminating power. They would probably have been hotly discussing the relative merits of the bar photometer and the table photometer; and they would have been turning over in their minds the question of the efficiency of combustion of different kinds of test burners. Any further matters in connection with testing instruments would probably have been of very minor interest to them. And yet, within the short space of five or six years, it seemed to him that the whole practical aspect of gas testing had changed. In connection with photometry, what would interest them now would be the testing of the illuminating power of incandescent mantles, of high-pressure lights, of illumination, diffusion, and the rest of it. They should also, he thought, consider questions of calorimetry, the constituents (and therefore the gravity) of gas, and the possibilities of increasing the make within the limits of the apparatus in the retort-house, and so on, at present available. They ought, too, to be interested in the efficiency of gas cooking and heating apparatus and water-heating apparatus. This was a list of the departments in gas testing which it seemed to him were just now of importance; but, obviously, it was impossible for him to go through the whole of it. Therefore it was necessary for him, in the time at his disposal, to limit himself to a particular aspect; and so he would deal with some examples of types of apparatus which he had arranged to exhibit in the meeting-room.

The question of calorific power was undoubtedly becoming exceedingly important. They had already seen that legislation—which was usually a good deal behind the times—had woke up to the fact that there was such a thing as calorific power, and that it was of value to the consumer; and once the thin end of the wedge had been driven into the legislative machine, there was no doubt that it would end by becoming a matter of importance from the statutory point of view, quite apart from the interest it had for those who were engaged on the works making gas. In these circumstances, he thought it would be conceded that there was no harm in looking over a type of apparatus they had available for making calorific tests, and for making doubly certain that the test that was going to be placed in the hands of hard, unsympathetic municipal testers should not be capable, either by accident or through ignorance, of yielding results which were unfavourable as compared with the actual value of the gas. The gas industry wanted, that was to say, to be particularly careful that they did not put themselves in the position with respect to calorific power under which they groaned for so many years with regard to the No. 1 "London" argand burner.

One of the things in connection with calorimetry was the question of dependence of the reading, in the ordinary apparatus, on the amount of moisture there was in the atmospheric air feeding the instrument. That was to say, they could get one result with air under certain conditions and temperature, and they could get quite another result with the same gas with the air under different conditions and different temperature; and it was perfectly obvious that, if they could get two dissimilar results in a perfectly *bonâ fide* way with the same gas, they could not both be right. He thought he could show them that in nine cases out of ten, when the ordinary calorific test was made, the result that one got on the calorimeter as the gross calorific power was always lower than the real gross calorific power of the gas; and, if this was so, and they could eliminate this error, which was on the low side, it would clearly be a good thing. They would agree that, if they had to work to a calorific standard, every B.Th.U. they could get from the gas was worth squeezing out. He would refer them to the abstract of the report of the Committee on Calorimetry of the American Gas Institute, which had been very well done in the "Journal of Gas Lighting" [see pp. 399, 459]. The report dealt with certain kinds of calorimeters; the Committee stating that the main object of the investigation was to study calorimetry with the idea of determining, as far as possible, the factors which influence the accuracy of measurements. They altered the temperature of the inlet-water by stages from 40° Fahr. to 80° Fahr., and made other variations; and if the members went through the figures, they would be astonished to find that, with gas of practically 600 B.Th.U., alterations in method enabled them to get results from the calorimeter showing as great a variation as 30 to 40 B.Th.U. Now, this was a very serious matter; and he thought it arose from the fact that it was possible to alter the temperature of the inlet water and outlet products in relation to the other factors in a quite *bonâ fide* way. If they could ensure that all these conditions were automatically maintained in the calorimeter at a constant level, they would see (if this level was the one that gave the best results) that this was just what they wanted to bring about.

He thought they could do this in various calorimeters, if properly adapted; but the specimen he wished to show them was the Simmance-Abady type, with a little adaptation to it. The first point about this arrangement was that it automatically prevented the very alterations which the American Calorimeter Committee proved made such a difference in the results; and the second point was that it removed the possibility of the results being lower than they should be from the percentage of moisture in the air varying in the way in which, of course, it would vary from day to day. The question of the alteration in the results of calorimeters by manipulation—that was, by altering temperature, &c.—he would leave the members to verify for themselves; but the other point, about preventing the loss due to the vapour content in the atmosphere varying, was demonstrable upon arithmetical grounds.

The following table showed the contraction on burning gas with air.

Constituent.	Percentage.	Air Required. (Approx.)	CO_2 Produced.	Nitrogen Remaining. (Approx.)	
CO_2	3	0	3	0	
C_nH_m	4	57	8	46	
O_2	1	0	0	1	(*i.e.*, O_2 in gas)
CO	10	24	10	19	
CH_4	30	287	30	230	
H_2	50	120	0	95	
N_2	2	0	0	2	
	100	488	51	393	
		588	444		

Thus the loss on contraction equalled 144 volumes, or practically 1½ times the volume of the gas; so that they could always arrive at the volume of products that they would get from the combustion of a certain volume of gas by deducting from the volume of air taken one-half of the volume of gas. If they took one volume of gas and five volumes of air—that was, six volumes—they would get five volumes of products, less one-half the volume of gas, or 4½ volumes of products.

The next point was they must realize that the air issuing from the calorimeter went over wet surfaces inside the instrument, because it was covered with condensed moisture, and therefore the air passing out was saturated. The air going in was not

saturated; and the degree of saturation depended on a variety of factors. They would thus see that the air going into the calorimeter would carry in with it a certain amount of water vapour, which would depend upon the percentage of saturation of the air, and would also depend upon its temperature, because the amount of water vapour the air would carry varied at different temperatures. The point about the water vapour was this—that if the water vapour which was formed from the combustion of the hydrogen in the gas was not condensed, they did not get added to the thermometer the latent effect of its change from the vapour to the liquid state. If they had 9 volumes of air going in at (say) 10 per cent. saturation, they would have 8½ volumes of products, and these were saturated; and so long as they were at the same temperature as the temperature going in, it followed that they would take away considerably more water vapour than nine volumes of air unsaturated carried in, and instead of the excess water vapour being condensed it passed away, and they got a low reading of calorific power. This low reading would depend upon the temperature of the air and degree of saturation, and the difference between the temperature of the air and the products. The lecturer then explained an arrangement devised by Mr. Simmance and himself to deal with this matter, as a further alternative to the two forms of their "Total Heat" calorimeter which was dealt with and illustrated in an article by Mr. Abady, on the "Calorific Control of Gas Making: Its Use and Limitations," which appeared in the "JOURNAL" for Dec. 24 last, p. 956. This form of calorimeter, he thought he was entitled to claim was a device which would be of utility, especially when they had official tests, because in addition to preventing the water vapour heat loss explained above, it also took away at one fell swoop anybody's licence to make tests with any difference of inlet and outlet temperatures, and the other details of manipulation which the American report showed capable of adversely affecting results by 30 or 40 B.Th.U. Everything about it was automatic and scientifically accurate, except that the results would be ½ to 2½ B.Th.U. too high. This, however, was on the right side, because they could strike out (say) 1½ B.Th.U.

Proceeding to deal with the recording calorimeter, he emphasized the fact that he was not there to simply puff the things he was connected with. It was an unfortunate accident that he happened to be associated with testing instruments; and in saying what he did, he had no wish to cast a slur upon apparatus made by any other firm than Messrs. Alexander Wright and Co. He then proceeded to deal with the "Gravitometer," for recording the specific gravity of a gas. Drawings of both these instruments were given in the issue of the "JOURNAL" last referred to. Continuing, he remarked that he did not propose to say why gravity was important, or why calorific power was important. These were matters on which they all had their own views; but generally speaking, as he had stated in his article written for the "JOURNAL OF GAS LIGHTING," he thought what they wanted to aim at was an increase in the make of gas which increased in calorific power and increased in gravity.

Now, he wanted to refer briefly to the question of composition of gas. Gas-making was being reduced to the single factor of making as much gas as one could of a certain calorific power, and therefore a certain composition; and it seemed that everything was being standardized much more than it used to be. Thus they would be able to get an accurate guide to what they were doing by the analysis of their gas. He had on the table a sample of Taplay's combustion gas analyzer, which was designed to do away with what he had found, and what Mr. Taplay had found, was the uncertainty in gas analysis—namely, the explosion of the residual gas. He pointed out the main features of Mr. Taplay's apparatus, which was described and illustrated by the inventor in the "JOURNAL" for April 23 and 30 last, pp. 217, 285.

The last instrument described by Mr. Abady, by the aid of a specimen on the table, was an entirely new complete gas analysis apparatus designed by Dr. Leonard A. Levy. He explained that Dr. Levy had been with his firm for some little time, but he had already shown his inventiveness, and would soon become well known to the gas industry. The most essential of the novelties embodied in this apparatus is the silica-platinum capillary tube for the estimation of the combustible gases. This tube was briefly described in a paper read before the Society of Chemical Industry in December last, and is embodied in two new instruments for the examination of the air of mines. By the use of this tube, the carbon monoxide, hydrogen, and methane are all determined with ease and certainty. The number of absorption pipettes required is thus reduced to three, and the troublesome and uncertain cuprous chloride absorption is avoided. The inaccuracies of the explosion method for the determination of hydrogen and methane are also entirely obviated. The advantage over the copper oxide method of combustion is that the latter does not permit of a determination of the carbon monoxide, excepting by cuprous chloride absorption. Dr. Leonard Levy will very shortly give a full account of the apparatus and his experiments, in an article which he has promised to communicate to the "JOURNAL."

At the conclusion of the lecture, a number of questions were addressed to Mr. Abady. The President remarked that the gas industry were greatly indebted to firms like Messrs. Alexander Wright and Co. for the inventive faculty displayed in all their apparatus. Within the last few years, there had been a very great improvement in instruments of this kind; and this improvement all helped both gas makers and gas sellers towards the ideal, which, he believed, was constancy in everything. Mr. Abady replied to the different points raised, and pointed out that the details which the members had admired in the different forms of apparatus were entirely due to Mr. J. F. Simmance; and if anyone in the gas industry felt indebted to Messrs. Alexander Wright and Co. for designing instruments, there was only one person to whom thanks were due, and that was Mr. Simmance. He (Mr. Abady) did to a certain extent assist with suggestions in working out the apparatus, but it was owing to Mr. Simmance that the finished apparatus was brought forth.

A hearty vote of thanks having been accorded to him for his lecture (on the proposition of Mr. J. G. Clark, seconded by Mr. W. Newton Booth, and supported by Mr. J. Hewett), Mr. Abady, in reply, said he was glad if he had interested the members, and he would come and talk to them again as often as they liked.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

Visit to the Dawsholm Gas-Works at Glasgow.

In connection with the visit of the members to Dawsholm Gas-Works, Glasgow, on Saturday afternoon, the chief object of interest were the Glasgow verticals, the invention of Mr. Alexander Wilson. These vertical retorts are on the intermittent-continuous principle—intermittent because drawing and charging are performed at definite intervals of from three to four hours, and continuous because only a portion of the charge is drawn, never reducing the contents of the retorts by more than a third. The duty of explaining the system to the visitors was greatly simplified, as most of them had attended, a fortnight previously, the lecture given by Mr. T. Carmichael, under the auspices of the Association. Mr. Carmichael's paper, reproduced in the "JOURNAL" (p. 395), explained the working in detail.

After the visit, the members and their friends, to the number of about 130, were entertained, as the guests of the Glasgow Corporation, at tea in Rombach's Restaurant—Councillor Irwin, Sub-Convener of the Gas Committee, presiding.

Mr. BLAIR (Helensburgh) was called upon to say a word, as "one of the patriarchs in the gas making of Scotland." He had seen great changes in his day, and might say he had been among the earliest to start manufacturing gas upon the vertical system. It was a big and radical change for anyone to undertake in a gas-works such as theirs at Helensburgh. But he did not see they had any cause to regret the installation; for it had given great satisfaction, and they were being emulated in countries all over the world. The installation they had seen that day, however, had different features, as compared with their continuous process. He was particularly struck with the Glasgow system, because of its cleanliness and the minimizing of the smoke and coal dust nuisance. Mr. Wilson was certainly to be congratulated.

Mr. HENRY O'CONNOR (Edinburgh) said the first thing that had struck him in his inspection was the shape that Mr. Wilson had chosen for his retorts. Personally, he thought that, if the space were available, the round retort would be the best shape possible, so that the radiant heat from the sides of the retort would pass through all the coal until it got to the core. But Mr. Wilson pointed out that this would need a much larger space. He (Mr. Wilson) had adopted a plan which he thought far ahead of the others he had seen, in that he had made the retorts long and narrow. Where there was a large quantity of gas to be made, there was no doubt that vertical retorts were the best things to be put in; but in smaller works they did not get the full return for the money invested. The old-fashioned retorts would still have their uses. He wished, in conclusion, to thank the Corporation and Mr. Wilson for the pleasure of their visit.

The PRESIDENT (Mr. F. L. MacLaren) returned thanks on behalf of the members, and said as young men they had to congratulate themselves upon the very great opportunities they were experiencing in their training. They recognized that they were getting chances never given to those who went before them. Their visit that afternoon was sufficient proof of the assertion. They had found Mr. Wilson going forward with a method of manufacturing gas which was apparently going to be superior, from many points of view, to the old system. The unhealthy duties associated with the stoker were by this new means being eliminated.

Councillor PATERSON replied on behalf of the Corporation, saying that, when the proposal to entertain the members after the inspection of the works came up, it was agreed to with hearty unanimity.

Mr. WILSON, in adding a word, said he had never spoken a great deal about their vertical retorts. When asked for information, he had stated that the vertical installation at Dawsholm was made to suit the needs of Glasgow. In the West of Scotland, they had peculiar needs in carbonizing; and he endeavoured to meet these needs. It was little use comparing one process with another, unless one compared them under exactly similar conditions. He had been chary of publishing results. He said rather, "Come and see the process yourselves; and, if necessary, try some of your coal in it. If you think another process is better, get them to test your coal." The installation at Dawsholm was working very steadily. Their aim had been to get a system of carbonizing that would work well, give them good results, make it comfortable for the workers, and cost little for upkeep. He thought the retorts were going to last a long time; and they could judge from the trial set at Temple, which had worked efficiently for four years. In speaking generally of Glasgow, he said their outside work at the present time was enormous. There had never been such a demand for appliances. He moved a vote of thanks to the Chairman.

Mr. JOHN WILSON (Falkirk) performed a similar service in regard to the artists, who contributed to an enjoyable programme.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Annual General Meeting of the Association was held last Thursday, at the Grand Hotel, Birmingham. There was a large muster of members; and at the opening of the proceedings, the retiring PRESIDENT (Mr. A. Cooke) was in the chair.

The minutes of the last meeting were first read, and confirmed.

THE KNIGHTHOOD OF THE PRESIDENT OF THE INSTITUTION.

The HON. SECRETARY (Mr. Harold E. Copp, of West Bromwich) read a letter from Sir Corbet Woodall, addressed to the President, asking him to accept himself, and to convey to the members of the Association, his cordial thanks for the letter of congratulation sent to him.

Mr. J. FERGUSON BELL (Derby) moved that the letter be entered on the minutes. They were delighted with the honour conferred upon Sir Corbet Woodall.

Mr. B. W. SMITH (Walsall) seconded the motion, remarking that he regarded the knighthood of the President of the Institution of Gas Engineers as an honour to the profession, and they should make as much of it as possible.

The motion was unanimously carried.

EDUCATION OF GAS-FITTERS' COMMITTEE.

The HON. SECRETARY reported that, in accordance with the resolution passed at the last meeting, he had written to Mr. Dunn asking that Mr. J. Ferguson Bell might be permitted to remain a member of the Committee dealing with the question of the education of gas-fitters. Mr. Dunn had written to say that the Council of the Institution had most cordially acceded to the request.

COMMERCIAL SECTION.

The HON. SECRETARY said he had also to report that the Committee, appointed at the last general meeting to consider the question of the formation of a Commercial Section, held a meeting on Feb. 6; and the matter was thoroughly discussed. The decision arrived at was that it was advisable to form this Commercial Section at once. The question as to whether it should be affiliated with the British Commercial Gas Association, or with the Midland Association, was not decided. There appeared to be some difficulties that were unforeseen at the time. A further meeting of the Committee would be called, at which something definite would probably be done.

NEW MEMBERS.

Proposed by Mr. B. W. SMITH, and seconded by Mr. F. J. WARD (Knowle), the names of Mr. Charles M'Pherson, of Clay Cross, Mr. Frank L. Wimhurst, of Newcastle (Staffs.), and Mr. Herbert White, of Hadley, were added to the roll of members.

THE LATE MR. TEW.

The Hon. Secretary read a letter from Mr. Walter S. Tew, in which he thanked the members on behalf of his sister, brothers, and himself, for their kind message of sympathy to them in the loss of their father. He also thanked the members for the beautiful wreath which accompanied the message; and he added that the sympathy of their friends was a very real source of comfort to them in their hour of trouble.

ANNUAL REPORT AND ACCOUNTS.

Proposed by the PRESIDENT, seconded by Mr. W. LANGFORD (Longton), the Committee's annual report and the accounts were adopted. The former reviewed the proceedings of the year, and ended by stating that it closed with 111 members on the roll. The year began with a balance of £70 8s. 1d., and closed with one of £79 0s. 8d.

INSTITUTION COUNCIL REPRESENTATIVE.

The PRESIDENT proposed, and Mr. J. FERGUSON BELL seconded, the election of Mr. W. S. Morland, the incoming President, as the District Representative on the Council of the Institution of Gas Engineers.

BRITISH COMMERCIAL GAS ASSOCIATION.

The HON. SECRETARY stated that he had received a number of communications from the British Commercial Gas Association. There was not time to consider them all at this meeting. But there was one, dated Feb. 15, which informed them that the total subscription now received on behalf of the Association from the district entitled the district to have another representative on the General Committee, and asked that a member be elected.

The PRESIDENT pointed out that this was a matter that only affected subscribing undertakings; and therefore only representatives of such undertakings could vote.

Mr. BELL proposed that a gentleman representing a large subscribing Corporation should be elected, and he had pleasure in nominating Mr. Hubert Pooley, of Leicester.

Mr. W. M'INTOSH VALON (Stafford) seconded the motion, which was unanimously carried.

Mr. POOLEY said he was extremely obliged to the members for their confidence. He should endeavour to uphold the traditions of the Midland Association, and look after the interests of the division of the country which they represented.

The HON. SECRETARY said, in connection with the membership campaign for the British Commercial Association, he had been asked, as Hon. Secretary of the Midland Association, to issue a circular-letter appealing for further subscribers. He conferred with the President; and they came to the conclusion that in all probability every member of the Association was heartily in accord with the objects of the British Commercial Association, and consequently a letter would be superfluous. For this reason, a letter was not sent out. He had written to the Secretary of the British Commercial Gas Association to this effect.

Mr. E. ALLEN (Liverpool) thought something should be done by this important section. He did not for a moment venture to differ from the President and the Hon. Secretary on the point as to the necessity of issuing a letter, but something should be done. It just suggested itself to his mind that the gentlemen who formed the Sub-Committee dealing with the question of a Commercial Section might take this matter up, because there was no doubt that a little canvassing on the part of the members of the Association for the object in view would be beneficial. He did not think the Midland Association would be willing to take second place to the other Associations; and, by doing something, they might increase the membership of the British Commercial Gas Association. He therefore proposed that the matter should pass into the hands of the Sub-Committee who were considering the question of the Commercial Section.

Mr. LANGFORD seconded the motion; and it was carried unanimously.

PRESENTATION TO THE RETIRING SECRETARY.

The PRESIDENT said the year of his office was coming quickly to a close. But he had the pleasing duty before leaving the chair of asking their retiring Secretary (Mr. Harold E. Copp) to accept, at the hands of the members, a silver tea and coffee service and salver. To the suggestion that he made to the members, there was a very hearty response in the shape of subscriptions; and the result they now saw before them. He asked Mr. Copp to accept from the members this small token of their appreciation of his services during the four years that he had held the office of Hon. Secretary. [Applause.]

The inscription on the salver was

Midland Association of Gas Engineers and Managers.

Presented to

HAROLD E. COPP, ESQ.,

In recognition of his Services to the Association as Honorary Secretary during the past Four Years.

February, 1913.

Mr. COPP said he was entirely at a loss to convey to the members his sense of appreciation of the magnificent present that the members had seen fit to give him. He had felt, during the time he had held the office of Hon. Secretary, that the efforts he had put forward for the well-being of the Association had perhaps to some extent miscarried. There was certainly a considerable amount of work in connection with the office. When the President first referred to the matter of a presentation, he took him (Mr. Copp) wholly by surprise. He did not profess surprise now, because it was some little time ago that it was mentioned to him. But he then felt a little compunction as to permitting the President to say anything further about the matter. The members would pardon him if he spoke perhaps a little candidly. They knew his feelings in the matter. He did not think—at any rate, lately—the Association had occupied the position, or wielded the influence in the gas industry, that it ought to do. The Midland Association met in Birmingham, which was the middle of the country. He should like the Association to occupy a position in influence corresponding with this geographical position. Both the Manchester District Institution and the Southern District Association were displaying much activity; and he should like the Midland Association also to occupy its legitimate place "in the sun." Although he was relinquishing the position of Hon. Secretary, the occupation of which he had enjoyed, his interest in the Association would not wane. He should, if possible, be keener in its welfare than ever he had been before—not necessarily on account of the beautiful present the members had given him, but because he felt very keenly for the welfare of the Association. One could not occupy such an office for four years without acquiring a feeling of this kind. He hardly knew how to express his thanks to the members. To merely say "Thank you" did not convey his feelings in the slightest degree; but he could assure the members that he did appreciate, in a very real sense, their kindness to him. This present would be one of his most cherished possessions; and he should look back on his four years' service as Secretary of the Association with great pleasure and with kindly feelings towards the members of the Association. [Applause.]

THE RETIRING AND THE NEW PRESIDENT.

PRESENTATION OF A PRESIDENT'S MEDAL BY MR. COOKE.

The PRESIDENT said the time had arrived for him to vacate the chair. The twelve months that he had occupied it had passed very rapidly. It had been a great joy to him to be President of the Association. He could honestly say the members of the Association had done everything they possibly could to make the

office tenable by him. They honoured him by visiting Oldbury in good numbers; and he only hoped they would show the same amount of good-feeling to the new President that they had shown to him. He asked the incoming President to accept from him a President's medal to wear, and to hand down to his successors. He had much pleasure in decorating Mr. Morland with the emblem of office. [Applause.]

[The medal which Mr. Cooke, in commemoration of his year of office, has handed to the President for use and transference to the successors in the chair as their badge of office, is a gold one, of ornate design. Round the face is the title of the Association. Across the centre of the medal is a bar bearing the word "President." Above this is the Birmingham coat of arms, and below the representation of a gasholder. The back of the medal is left blank for engraving upon it the names of succeeding Presidents.]

Mr. W. S. Morland (Gloucester) took the chair amid the applause of the members.

The President said before he proceeded with his address, there was one thing he must do, on behalf of the members—that was to thank Mr. Cooke very heartily indeed for the handsome medal he had presented to the Association for their Presidents to wear. He also thanked him on behalf of himself and future Presidents. He hoped the Association would exist for many years to come and that their Presidents would wear the badge long hereafter. He should also like to propose a cordial vote of thanks to Mr. Cooke for his services as President during the past year. They had known Mr. Cooke as Committeeman and as Secretary for a number of years; and they knew how admirably he filled these positions. But he (Mr. Morland) thought as President Mr. Cooke excelled himself. He had therefore the greatest pleasure in proposing the heartiest vote of thanks to him for his services in the chair during the past year.

Mr. Allen had much pleasure in seconding the vote of thanks for the able work of Mr. Cooke, and the excellent way in which he had filled the office of President of the Association during the past year. He had given a strong indication of his interest by presenting the Association with a President's Medal. He had certainly come out of his year with great *éclat;* and his name would be associated with the medal through what they all hoped would be the long future history of the Association. Might he join in the wish that Mr. Copp had expressed that the Midland Association should acquire the position it ought to hold in their great history? He was sure that no other Association would be envious. If the Midland Association made a step forward, it would be an incentive to the other Associations. Such happy emulation would be for the good of the whole industry. They had in the Midlands an excellent Junior Association, which augured well for the future of the Senior Association. But he urged the present senior members not to wait until the junior members "grew-up" in the profession, as he was sure success would attend their personal efforts to place the Association in the position it should occupy. Reverting to the British Commercial Gas Association, what had been successfully accomplished in other parts of the country had been done through the personal efforts of the Committee. If each member got one undertaking not represented in the British Commercial Gas Association into its membership, great good would be done. Let them see that the Midland Association took its proper place in the gas industry.

The motion was heartily carried.

Mr. Cooke said he very much appreciated the vote of thanks. When he took the office, he said that he would do his best, and that it would be a pleasure to do all he could for the benefit of the Association. He had tried to do his best; and it had been a pleasure. Although he had passed the chair, he should feel as great an interest as ever in the Association.

The President then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—I must first thank you for the honour you have conferred upon me by my election to the distinguished position of President of the Midland Association of Gas Managers. When I look back upon the long list of Past-Presidents who have so eminently filled this position, I feel that I have incurred great responsibility in accepting the office. I, however, promise you I will do my best to keep up the traditions of the Association, and at the end of my year of office to pass them on unsullied to my successor in the chair.

TRADE PROSPERITY.

We as a nation have to congratulate ourselves on the magnificent results of the trade of this country for the past year. We have passed through one of the most disastrous coal strikes that has ever taken place in its history. The coal supplies for gas and other industries were cut off for six, and in some cases eight, weeks—thus disorganizing the whole trade of the country. But notwithstanding this general disorganization of business, we have had a record year in trade generally. Our aggregate trade has reached the enormous figure of £1,344,168,000, as against £1,237,000,000 in 1911, or an increase of £107,168,000.

From what one hears, the gas industry has had its share of this general prosperity. We certainly have had to pay more for our coal supplies and other requirements; but against this we have had better prices for our residuals, though not sufficient to meet the extra cost incurred. Many of our undertakings have had big increases in the output of gas, which have also helped us.

The demand for coal tar for the purposes of road-making is becoming more general; and if this method is not superseded, we shall for some time to come have no difficulty in disposing of this commodity at profitable prices.

COAL STRIKE.

The stoppage of our coal supplies, and, previous to the stoppage, the difficulty in getting coal delivered, caused great inconvenience to many gas-works all over the country. Soon after the railway strike in the summer of 1911, my Directors decided that we should carry a stock of coal equal to our two heaviest months' consumption; and I was instructed to buy sufficient to make our stock up to this. I was very fortunate in being able to purchase the coal at a price considerably below that which ruled about a month afterwards. Being thus prepared when the strike commenced, we were able to face the situation with equanimity, and to give our consumers a full supply of gas and coke. As the price of coal advanced to such a high figure, a large number of our consumers used gas wherever it was possible to do so in place of coal, and kept their coal in reserve. I heard of many cases of our consumers with slot-meters helping their neighbours who had not this boon, by allowing them to come in to their houses, drop their pennies into the slot-meter, and cook their meals there. I need hardly say that this was a splendid advertisement for gas in our city.

I think it is the duty of those responsible for the management of gas-works generally, after our past experience, to see that they always have in stock a large reserve of coal. In my opinion, when the next colliery or railway strike takes place we shall not get as much warning as we have had in the past. One must not lose sight of the fact that gas-works are not run on coal alone. We must see that we also have good stocks of oil, vitriol, and any other thing required in the process of gas manufacture.

In our case I first used the stock of coal nearest to our retort-houses, which coal had been longest in stock—leaving the more recently stored coal to be used later on (if necessary), as I expected it would yield more gas. When our deliveries were resumed at the end of the strike, we had still in stock enough coal to last us another six weeks.

Some of the coal we used had been in store under cover for twenty years. I found that it had not depreciated in the yield of gas to a greater extent than 10 per cent., though the coke made from it was not so large as that from the more freshly wrought coal. I had previously come to the conclusion that coal which was suitable for storing depreciated up to a certain point soon after it was stored, and after that time the depreciation became insignificant; and this has been confirmed by my recent experience. I had, therefore, in the past made a practice of leaving the coal in store until it was required—thus saving the repeated depreciation of the fresh wrought coal and the repeated cost of storing, which would amount to a considerable sum in the course of a few years if all the coal were cleared out annually. Carrying a large stock of coal I know locks up a considerable amount of capital; but at the same time it is a good investment, and well repays the outlay in a time of panic and when the day of trial comes.

BRICK RETORTS.

As I have had upwards of 25 years' experience of the use of brick retorts, it may be interesting to the members to hear something about the durability of our settings which have been constructed with these retorts.

My father, Mr. Robert Morland, designed and laid out the works of which I am at present in charge. As a boy, I remember that clay retorts were used in the first six settings that were constructed there. I presume in those days the retorts would be hand-made. The life of these retorts averaged about three seasons, or perhaps a little more, after which it became necessary to renew the whole setting. My father, having had previous experience of brick-built retorts at his old works, and not being satisfied with the life of the clay retorts, went back to those constructed with bricks; and these have been used there ever since. We did try a few settings of segmental retorts; but our experience with this type was that they were not so satisfactory as those built with bricks. The segments, being larger, got out of place; and if any shrinkage occurred when cooling down, the joints opened-up more and were more difficult to stop, being less numerous than in the retorts with the smaller bricks, and they did not so readily get covered with carbon when working. We also found the life of a segmental retort was not so long as that of the brick retort.

The advantage of a brick-built retort is that if a bottom, a springer, or any part of the retort is damaged, it can be repaired at very little cost, without destroying or disturbing the whole setting. We have had some of these settings working for more than ten years before they had to be renewed, allowing for the usual stops for repairs to furnaces, &c. In our No. 2 retort-house, which was erected in 1887, we put in regenerative settings, and have only renewed them three times. The third lot of settings now in use has up to date worked 1050 days; and it is still in good condition.

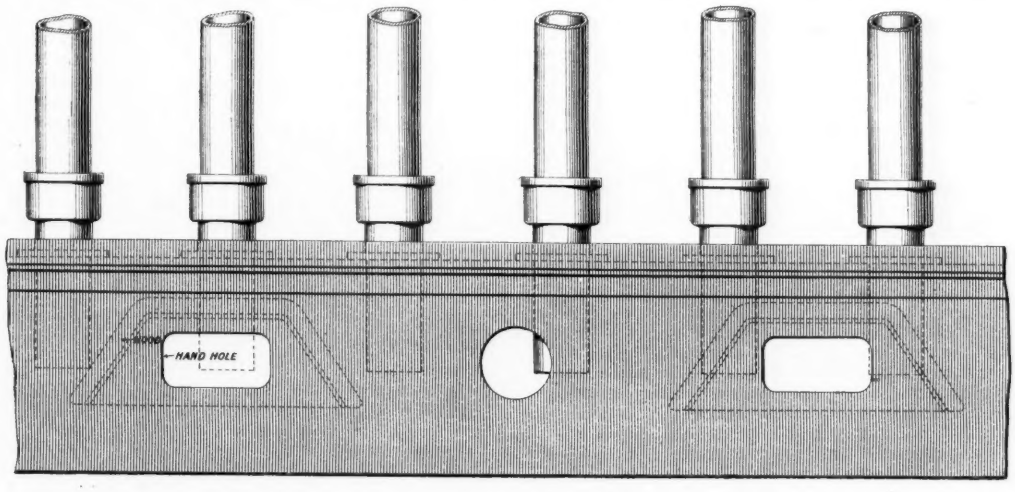
Brick retort-settings require to be very carefully built. Good material must be obtained for the combustion chambers, and very great care must be taken in laying the bricks which support the retorts. For the jointing material, I have for many years made a practice of grinding up our old fire-bricks in a mortar mill; and

carefully sifting the stuff and using in the proportion of two of ground fire-brick to one of the material as supplied by the fire-brick manufacturers. By adopting this mixture, I found that the settling-down and shrinkage of the setting was very slight. It is, of course, absolutely necessary that the materials used in the settings should have been raised in the burning to a temperature, if possible, as high as that they are likely to experience in the retort-setting when fired. I personally like to see all the fire-clay goods I use a good dark brown colour. I then know that there will not be much shrinkage afterwards.

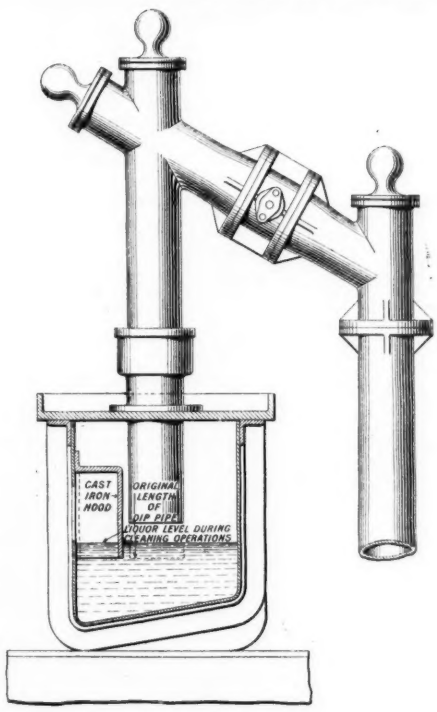
HYDRAULIC AND DRY MAINS.

As I know some of our members have "hydraulic" and others "dry" mains, it may be of interest if I tell you what we have done in Gloucester. My friend and neighbour, Mr. R. O. Paterson, had used for many years what are known as "dry" mains, which I understand were introduced into the Cheltenham Gas-Works by Mr. Esson, Mr. Paterson's predecessor; and this method has been in use there ever since. We in Gloucester used hydraulic mains.

But, with the introduction of the retort-house governor, I was enabled to convert one of my retort-houses from a hydraulic-main house to a dry-main house. As I did not like the idea of burning my boats entirely, I cut about 5 inches off each of the dip-pipes, leaving them long enough to be still used with a seal if found necessary. I scrapped the bridge pipes, and introduced a pipe and a throttle valve in the position shown on the drawing



Longitudinal and Cross Sections—Showing Hydraulic Main Converted to Dry Main.



I also increased the length of the ascension-pipes for the centre top and the centre middle retorts, as I found with the ordinary length that these ascension-pipes stopped. I also introduced aprons inside the hydraulic main at the hand holes, as shown, so that water could be run into the hydraulic to a height sufficient to seal these aprons, but low enough to allow the gas to pass freely from the dip-pipes to the foul-main. The hand hole covers can thus be removed, and any solid matter can be readily taken out of the hydraulic main without throwing the retorts out of action. I found this retort-house worked so satisfactorily that I have converted my second retort-house to this system.

On many occasions with hydraulic mains in use we have fixed a recording gauge on the ascension-pipe of a newly-charged retort; and although the seal was as light as it was possible to make it with safety, it was not an uncommon thing to have as much as 1½ to 2 inches of back-pressure, which gradually came back to about 1-10th when the charge was worked off. With a dry main, if we set our retort-house governor to work at 1-10th back-pressure, the back-pressure in the retort is the same, and continues so until the end of the charge. I always make a point of working with a slight back-pressure in the retort. My experience has been that if there is any exhaust on the retorts, and a slight leak in any of the lids, air is drawn in, and a portion of the gas is burnt in the retort. As we purify entirely with lime, the carbonic acid produced is caught in the purifiers, and the efficiency of the lime per ton of coal carbonized is very quickly reduced.

There is one other advantage in the use of a dry main when compared with the hydraulic. Most of us, I expect, have experienced the difficulty of keeping the mains level. Consequently, one dip-pipe has slightly more seal than another. At times the hydraulic main valve on one setting may leak and allow the seal to run off or be reduced; and as one has the same amount of pull on the foul main for all the settings, the quality of the gas produced by a setting in this condition is much below that produced by another, and considerable mischief has been caused before the defect has been discovered. With a dry main, you can always rely on the gas produced from each setting being of uniform quality if it is worked under the conditions which I have stated.

LABOUR-SAVING DEVICES.

In the year 1906, we installed in our No. 2 retort-house West's combined charging and drawing machinery; our consumption of gas having increased sufficiently to enable us to work the machinery fully enough to get a proper return for the capital invested. At the same time we put in coal-handling plant.

We tip our coal directly into a hopper which supplies the coal breaker. The coal breaker is fed by an automatic feed, which can be adjusted for any quantity required up to 40 tons per hour; and the broken coal is elevated to a belt conveyor, which runs the whole length of the coal-store at a height of 34 feet from the ground level. The coal can be thrown off the conveyor at any point where it may be required in the coal-store. The retort-house coal-hoppers are fed by an elevator, which draws the coal from this store. We have a hopper built into the coal-store floor, fitted with an automatic feed which supplies the elevator boot. We can pile over this hopper sufficient coal, which will run to the hopper as required, for four day's supply for the retort-house. With this arrangement, the cost of labour for handling coal is very little indeed—viz., about 3-10ths of a penny per ton delivered into the hoppers in the retort-house. We have never experienced any difficulty with the automatic feed in this arrangement.

As I am a believer in working retorts with stop-ends, we continued to work the retorts thus for the first season with West's machinery, but found the men could not draw the retorts so rapidly as I thought they might if the retorts were "throughs." So I decided to convert them to "throughs" the following season. But I soon found out that any advantage that was gained by the more rapid drawing of the retorts was soon lost in other ways. I may say that we were then working with hydraulic mains. Our troubles commenced. Stopped ascension-pipes became very frequent, with the consequent loss of gas, and thick tar accumulated in the hydraulics—a thing we had never experienced to any extent before with stop-end retorts. Another disadvantage I

experienced was that if a stoking machine on either side of the house was thrown out of action through breakdown or any other cause, it delayed the charging of the whole house until the damaged machine was in order again.

I had many years before, for a short time, had experience with through retorts, with an ascension-pipe at either end, and experienced the same trouble with stopped pipes and thick tar in the hydraulic and foul main. This experience had given me good grounds for thinking that retorts with stop-ends were the best in the case of horizontals for gas making, and my second experience confirmed this. I arranged to again convert our retorts to those with stop-ends, and trouble with stopped pipes, &c., disappeared, and our make of gas per retort increased.

HANDLING OF COKE.

In dealing with the handling of coke, I thought the matter over very carefully; and after considering the merits of the conveyors then on the market, I came to the conclusion that tip waggons run on a narrow gauge light railway directly under the retorts would be the best method to adopt to answer our requirements.

The waggons, when loaded, run on rails, which incline towards the coke-quenching sprays. One of these waggons will hold the coke from four retorts. One man stands by the waggon to put it in position under the retort mouthpiece. When the waggon is filled with coke he gives it a push, and it runs towards the quenching spray, when another man quenches the coke, and then puts the waggon in position ready to be placed on the hydraulic lift when the draw is completed. Two men per shift deal with the coke from this retort-house, which contains 176 stop-end retorts. After the completion of the draw, one of the men remains at the bottom to put the loaded waggons on the lift, send them to the top, and receive the empties. The waggons are raised to a height of 32 feet, being 24 feet above the coke-yard level. The man on top runs the waggon along the overhead railway, tips it in any position required, returns with it empty, and receives another loaded one. We have roller bearings on these waggons, and very little effort is required to push them along. The quantity of breeze made with this method of dealing with the coke is very small. We consume nearly all we make in our boilers.

I have always made the boxes of our tip waggons of sheet plate. In my opinion, it is a mistake to have the boxes made of bars. The spaces between the bars allow the air to get to the exposed red-hot coke; combustion rapidly takes place; there is a very considerable loss in the weight of coke caused by this combustion; and the coke as a fuel is very much reduced in value. When coke is drawn into a box made of plate, which prevents the air getting into the body of hot coke, we find any gas that is generated has a tendency to reduce the temperature, by smothering the coke instead of burning it away. Two small holes in the bottom of the box allow any water to run away that gets there.

I have also found in constructing the boxes for these coke-waggons that it is better to use iron plates rather than steel. My experience with steel plates was that when they became hot the plates twisted badly—in fact, twisted so much that it became impossible to tip the waggons, as the boxes jammed in the waggon frames. The sudden cooling of the hot steel plates made them so hard, and caused them to set in the position to which they had twisted, that it was impossible to get the boxes back to their original shape. By using wrought-iron plate we have none of these troubles. The thickness of plate used is about $\frac{1}{8}$ inch.

The wear and tear on this plant is very little; and the cost of renewing a rail, wheel, or box is not very much. We make the boxes, and do the repairs ourselves. The risk of a serious breakdown with a coke-handling plant of this kind is not very great. I have now had seven years' experience of it; and I do not regret having adopted it.

EXHAUSTERS.

It may be a matter of interest to the members to hear something about the type of exhauster which we have in use. When our works were in the course of construction (gas was first made in them in 1877), my father intended putting in rotary exhausters, but about that time the steam-jet exhauster (as manufactured by Messrs. Körting Brothers) was introduced. He decided to give up the idea of rotary exhausters and adopt the steam-jet; and we have continued to use them ever since with every satisfaction. In looking up the report of the proceedings of the British Association of Gas Managers for the year 1877, I find Mr. R. O. Paterson, of Cheltenham, read a paper at the meeting, on his "Experience of a Körting-Cleland Steam-Jet Gas-Exhauster," with notes on its adaptability and economy. When reading through this paper, I observed, from the discussion that took place by those who also had this kind of apparatus in use, that some had fixed it immediately after their hydraulic mains, and others after their condensers. I think this has been the cause of this type of exhauster not coming more commonly into use. We have our exhauster fixed after all the plant, except the purifiers, and we of course have condensers after the steam-jet to condense the steam.

The exhauster which was installed at Gloucester in 1877 was said to be capable of dealing with from 240,000 to 960,000 cubic feet per 24 hours; but as a matter of fact we found that it did more. The wear and tear on this piece of apparatus from the year 1877 to 1908—a period of 31 years—would be more than covered by an expenditure of £5. Nothing but steam is required to work this type of exhauster; and it does its work with very little attention, as there are no working parts to get out of order. I was so satisfied with my 24 years' experience of this exhauster that I ordered one capable of dealing with a maximum of $2\frac{1}{2}$ million cubic feet per 24 hours, which cost £96; and I erected it in 1908. The old one erected in 1877 I fixed up as a stand-by; and from 1908 to the present time, we have not had cause to spend anything upon the new one for repairs.

With regard to steam required for the exhauster. We use a Lancashire boiler, 24 feet long by 6 ft. 6 in. diameter, fired with coke breeze which has passed through a coke fork with $\frac{3}{8}$-inch spaces between the prongs, and we can raise sufficient steam to supply the exhauster; two fresh water pumps, one liquor pump, an engine for driving the washer-scrubber continuously, and a tar-pump which works intermittently. A test has been made, and we find the fuel used for raising all the steam required for doing the above work, with a make of 1,600,000 cubic feet of gas per 24 hours, is 2 tons 6 cwt. of wet breeze and dust per diem.

The labour in connection with the regulation of the exhauster is practically *nil*. The man in charge of the boiler looks after it, and attends to the pumps, &c., which I have already mentioned. The introduction of the retort-house governor has simplified the regulation of the exhauster very considerably.

Mr. Paterson claimed for this type of exhauster that he found it increased the illuminating power of the gas by about 1 candle. We in Gloucester are under contract with the Corporation to supply gas of an illuminating power giving an average over the month of $15\frac{1}{2}$ candles, as tested with Sugg's No. 1 London argand burner. As a matter of fact, we supply gas of an average of $16\frac{1}{2}$ candles, and have no difficulty in doing so; and our sulphur compounds for the past twelve months averaged 10·37 grains per 100 cubic feet of gas.

OTHER DETAILS.

We have no water-gas plant; and we have never found it necessary to enrich our gas made from a mixture of Yorkshire, Derbyshire, South Wales, and Forest of Dean coals. As I have before mentioned, we purify entirely with lime, and consequently send our gas out free of carbonic acid. Any of you gentlemen who use Yorkshire and Derbyshire coals will know what illuminating power can be obtained from these coals with a rotary exhauster in use and without enrichment.

It may interest you to hear that by working on the lines I have mentioned, the average cost for wear and tear at our works for the past 15 years has been 1·84d. per 1000 cubic feet of gas made, which I know compares favourably with most undertakings. Our highest selling price for gas in the year 1900 was 2s. 6d. per 1000 cubic feet, less 5 per cent. discount. Since then we have reduced the price 8d. per 1000 cubic feet; and our selling price now is 1s. 10d., less 5 per cent. to ordinary consumers, which brings the net price to just below 1s. 9d.

CONCLUSION.

Before writing this address, I found it extremely difficult to determine what would be of interest to the members generally. After carefully considering the matter, I decided to give you some of my own practice and experiences, thinking that, as our works are not run on quite the same lines as most gas-works, such an address might not be without interest.

At the close of the address,

Mr. E. ALLEN proposed a vote of thanks to the President, and did so with the greatest pleasure. Listening to Mr. Morland, they had been in imagination on his works. An address of this nature, filled with matters with which the President was so conversant, was exceedingly interesting to every one of them. It was fortunate, for reasons which he (Mr. Allen) would not explain, that the address was not open to criticism. For certain reasons, too, one could have wished to have said something as to one's own views on matters that had been dealt with so ably by the President. He had taken a personal interest in Mr. Morland's remarks about the jet exhauster, because he happened to have assisted Mr. Cleland when introducing, about 1877, the Körting-Cleland jet, and for many years they used it at the Linacre works at Liverpool. They were not using it now; and he would not say why they were not. He was glad, however, that Mr. Morland was getting such excellent service from an inexpensive piece of plant. Talking of expense, perhaps they ought to add the cost to it of the condensers that dealt with the steam that had to be supplied to this type of exhauster. However, it was most inexpensive in maintenance.

Mr. W. J. R. BAKER (Great Malvern) seconded the motion, which was very heartily passed.

The PRESIDENT cordially thanked the members. He remarked that he was aware their methods at Gloucester were open to criticism; but, in their geographical position, and their price of gas, they had something very considerable to back them up.

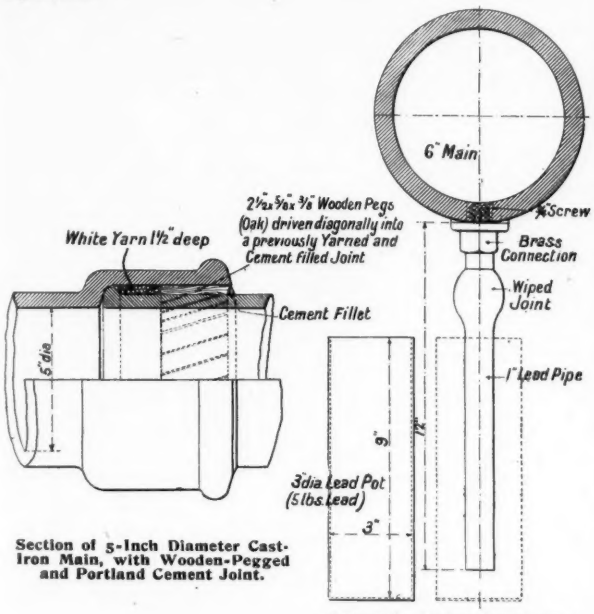
OLD METHODS OF PIPE-JOINTING.

Mr. B. W. SMITH (Walsall) then exhibited some interesting specimens of old methods of pipe-jointing found at Walsall. He read the following notes bearing upon these:

Two years ago, in taking up a cast-iron main to relay with one of a larger size, I came across 100 yards of 5-inch cast-iron pipe, the joints of which were made entirely as follows: With white yarn $1\frac{1}{2}$ inches deep, and $2\frac{1}{2}$ in. by $\frac{5}{8}$ in. by $\frac{3}{8}$ in. oak pegs driven diagonally into the socket previously filled with a cement, and finally finished off with a fillet of neat cement.

This is somewhat unique in my experience extending over many

years in laying mains; and, as I have never seen joints of this description before, I thought it would be interesting to the members to see how they were made. I have brought a socket broken in two, showing the actual construction; and from observations made while taking up the main, I did not discover one single sign of leakage, showing that any expansion or contraction had made no difference. The joint evidently depended on the moisture from the wet cement in the first instance, and subsequently from moisture from the surrounding soil expanding the wooden pegs (which I presume were wedged in dry), thus ensuring a perfectly tight joint.



Section of 5-Inch Diameter Cast-Iron Main, with Wooden-Pegged and Portland Cement Joint.

Automatic Syphon found on a 6-Inch Diameter Pipe on a Main-Road.

It appears that this main was laid some seventy years ago; the actual date I have been unable to obtain. It was laid about 18 inches to 2 feet deep under one of the old coach roads in the heart of the town of Walsall, and is supposed to have been one of the trunk mains, connected to the first gas-works which were erected where the Arboretum Park now is, dating back to 1826.

Another interesting feature about the main, where it was connected to a 6-inch one, was the discovery of a somewhat original syphon for carrying away the condensation, which consisted of a ¾-inch screwed brass connection, to which a 1-inch lead pipe 1 foot long was attached, with a wiped joint. To form the seal this pipe dipped into a 3-inch lead cylindrical pot 9 inches deep; and the seal I imagine was none too great, and only made with water, so that, when any condensation occurred, the latter had to find its way over the side of the seal-pot into the ground—the pot having been covered and protected from the surrounding ground with brick-ends.

On the proposition of the President, a hearty vote of thanks was accorded to Mr. Smith for having brought before the meeting the interesting specimens of a bygone practice.

This concluded the business proceedings.

Visit to Messrs. Stewarts and Lloyds' Works.

Shortly afterwards, the members were *en route*, in taxi-cars, to the Coombs Wood works of Messrs. Stewarts and Lloyds at Halesowen. The story of their interesting visit is told in a separate article (see p. 522).

On their return to the Grand Hotel, at the invitation of Messrs. Stewarts and Lloyds, the members were entertained to tea. After tea,

The President said he was sure that they would not like to leave the table without thanking their hosts for the very enjoyable afternoon they had given the members in visiting their works, and showing the manner in which tubes were made. Many of the members used the firm's tubes, and had possibly no idea as to the amount of skill and processes required in the production of such things as even small connections. They were indebted to the gentlemen who had taken them round, and had explained so much of interest; and they were likewise indebted to their hosts for the excellent tea which they had enjoyed.

Mr. A. Cooke seconded the proposition, and suggested that the Secretary should write officially to the firm, placing on record their thanks.

There was hearty endorsement of the proposal.

Mr. T. E. Upjohn said it was exceedingly kind of the President to have expressed his feelings and those of the members towards the firm in the way he had done. He could assure the members that it had given the greatest possible pleasure to him, his colleagues, and their assistants to show the visitors some part of the works. He could only thank them, in return, for having honoured the firm with their presence at the works.

LAMP RAISING AND LOWERING GEAR.

The "One Working Part" Automatic Connector-Suspender.

In connection with the central suspension of lamps, and the meeting of other requirements of a like character, the London Electric Firm, of Croydon, draw attention to their improved "one working part" automatic connector-suspender, for which a patent has been applied for, and also to their patent self-sustaining winch, for lowering large lamps for maintenance purposes. In this arrangement, all flexible tubes are dispensed with; and the connector device (fig. 1) is claimed to be exceedingly simple and efficient in its action. The actual connection is made between a cylinder and piston; and it is said to be so perfect that a compressed air pressure of 300 inches will not affect it.

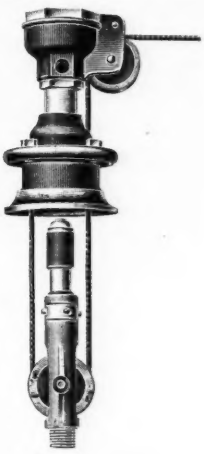


Fig. 1.

Fig. 3.

Fig. 2.

Many thousands of the suspension portion of the device have during the last few years been supplied for use with electric arc lamps—including a large number of sets for the City and other parts of London. It consists of a ratchet, the lower half of which is cut away at every alternate notch, to first allow the supporting pins to enter and become trapped, and subsequently to be released (see fig. 2). The weight of the lamp is thus positively taken by the suspension device, and is only on the winding-rope during the actual raising and lowering. No twist is given to the lamp, as, in addition to the pins forming part of a revolving collar, the ratchet itself revolves on its seat. To operate the gear, one has only to haul on the winch-rope until the pins reach a dead-stop at the top half of the ratchet. Then a slight backward turn allows them to drop by gravity into the lower half and become trapped. To lower, a slight turn on the winch-handle carries the pins up the face of the next ratchet, where they reach the free outlet.

The winch (fig. 3) contains a new mechanical movement, by which rotary motion is obtained from cam-grooves, and a positive self-sustaining feature is secured by exceptionally robust parts without recourse to pawls, triggers, springs, or similar devices. Yet the weight is held in any position during raising or lowering, whether the handle slips or breaks or the operator is suddenly taken ill, or any other catastrophe happens.

Both the devices, though substantial in construction, being built on true engineering lines, are small in size, and can therefore be adapted to existing lamps, as the one only alters the position of the lamp by a few inches, and the other is capable, if desired, of going into any ordinary lamp-pillar. They are also weatherproof, and are made of the highest grade materials. In the case of street-suspensions, any condensation forming in the supply-pipes is automatically discharged by the gear, through an arrangement involving no additional part whatever.

This combination of connector and winch, it is claimed, makes street-lamp maintenance modern, safe, and economical, and its cost of installation is saved in probably a year or so, compared with tower-ladders, besides lessening risk of accidents and interference with traffic. The devices are made applicable for suspension in practically any circumstances.

The London and Southern District Junior Gas Association will have their annual dinner at the Cannon Street Hotel next Saturday. On the 15th prox., a visit will be paid to the Poplar Works of the Commercial Gas Company; and at a business meeting on the 28th prox. an address will be given by Mr. T. Goulden, M.Inst.C.E., the Chief Engineer of the Gaslight and Coke Company.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Annual Meeting in Manchester.

The Forty-Third Annual Meeting of the Institution was held last Saturday at the Grand Hotel, Manchester. Mr. SAMUEL GLOVER, of St. Helens, the retiring President, was in the chair during the first part of the proceedings.

The HON. SECRETARY (Mr. W. WHATMOUGH, of Heywood) read the minutes of the last meeting; and they were approved.

NEW MEMBERS.

The election of the following new members was announced: Mr. W. B. M'Lusky, of Halifax; Mr. Samuel Cutler, of Belper; and Mr. Hedley Hoy, of Tyldesley.

Mr. M'LUSKY thanked the meeting for his election; saying he regarded it as a great honour.

ANNUAL REPORT AND ACCOUNTS.

The report of the Committee on the work of the year was next submitted.

The report showed that the Institution continues to make satisfactory progress. The membership roll now numbers 189, which is an increase of 13 for the year. Five members had resigned, and one member (Mr. Joseph Timmins, of Wigan) had died. "Mr. Timmins was one of the oldest members of the Institution, and was highly respected not only for his professional abilities, but for his kindness and geniality, and his loss is deplored by the members of this Institution and the gas profession generally." The general meetings had been successful; and the standard of the papers contributed has been maintained. After detailing the work done during 1912, the report continues: The Saturday afternoon lectures at the Manchester University were again well attended; and as they are of great benefit to the juniors and the members generally, a further grant of £15 has been made towards the expenses. The reports of the Commercial Sections have been issued to the members; and it will be observed that both sections continue to do good work. The Committee desire to place on record the conferring by the Leeds University of the degree of Doctor of Science upon the respected Treasurer of the Institution, Mr. Thomas Newbigging, M.Inst.C.E., who has during his long life rendered great and valuable services to the gas industry, and worthily deserves the honour conferred upon him. The members have granted the sum of ten guineas to the Benevolent Fund of the Institution of Gas Engineers; and the Committee plead for increased contributions from the members individually, as additional funds are sorely needed. The finances of the Institution are in a satisfactory condition; the balance in hand being £59 12s. 10d., compared with £53 12s. twelve months ago.

The HON. SECRETARY said the accounts showed that the Institution was in a better position than it was at the end of the preceding year in respect of the balance in hand, though a contribution of £10 10s. had been made to the Benevolent Fund of the Institution of Gas Engineers. The balance brought forward a year ago was £53 12s. The total income for the year was £162 9s. 5d., against £159 16s. 2d.; and the balance in hand was £59 12s. 10d.

REPORTS OF THE COMMERCIAL SECTIONS.

Mr. S. MEUNIER (Stockport) moved the adoption of the reports of the Commercial Sections for Lancashire and Yorkshire; remarking that the members who had not yet joined these sections would be well advised to do so. The hope was entertained, he added, since the British Commercial Gas Association was formed, that the Commercial Sections might ere long be affiliated with that organization, so that they would practically be under its control and supervision. The stronger they were, the greater would be the success of any movement in this direction. The British Commercial Gas Association and the Commercial Sections represented a great movement which was required for the benefit of the gas industry.

Mr. F. H. PICKLES (Kildwick), in seconding the motion, emphasized Mr. Meunier's words; stating that those members who had joined the sections might take it they would not only be of great help to themselves but to the commercial sections as well. Many members of the sections had testified to him as to the great amount of money they had saved through joining them.

REPRESENTATIVE ON THE GAS INSTITUTION COUNCIL.

The next business was the nomination of a district member of the Council of the Institution of Gas Engineers for 1913-14.

The PRESIDENT said the Committee thought they could not do better than re-elect Mr. E. H. Hudson, of Normanton, who had had charge of the question of gas-fitters' education and certification, and had taken a great deal of interest in the other work of the Council.

The nomination of Mr. Hudson for another year was moved by Mr. R. G. SHADBOLT (Grantham) and seconded by Mr. H. KENDRICK (Stretford), both of whom eulogized Mr. Hudson for his work during the year.

The nomination was accepted unanimously.

GRANTS FROM THE FUNDS.

The recommendation of the Committee that the following grants be made from the funds of the Institution was approved: Benevolent Fund of the Institution of Gas Engineers, £10 10s.; British Commercial Gas Association, £5 5s.; National Gas Exhibition, £5 5s.

In introducing the proposal to send £5 5s. to the British Commercial Gas Association, the PRESIDENT said that while they did not wish to restrain gas committees and boards of directors of gas companies from anything they might be disposed to do to assist the Association, the Committee thought it would be showing a proper appreciation of the excellent work of the Association if they subscribed this sum out of their funds.

Mr. E. A. HARMAN (Huddersfield), in moving the resolution, said they simply desired to express their individual approval of what was being done. A great many of the municipalities were prevented, in some mysterious way, from becoming members of the Association. It was only after a very long fight that his own Corporation had seen their way to become subscribers. They were at present only subscribers for half the asked-for amount; but he hoped that ultimately they would become full subscribers. The vote now proposed was only intended, as he had already suggested, to express the sympathy of members with the movement, which they considered most desirable.

The motion was seconded by Mr. R. WATSON (Doncaster), and, after some discussion, was carried.

On the proposition of Mr. MEUNIER, seconded by Mr. S. SHADBOLT (Fleetwood), the grant of £5 5s. towards the National Gas Exhibition to be held in London next autumn was agreed to.

CONGRATULATIONS TO MR. THOMAS NEWBIGGING AND SIR CORBET WOODALL.

The PRESIDENT, before proceeding to the next item on the *agenda*—the induction of Mr. J. C. Belton, of Chester, as his successor in the presidential office—invited the members to join him in expressing gratification at the honour done to the gas engineering profession in general, and to their old friend and Treasurer in particular, by the Leeds University conferring on Mr. Thomas Newbigging the degree of Doctor of Science. If it was the members' good wish that they should enter this congratulation on their minutes, and that he should send a message to Mr. Newbigging, he would be glad if they would show it in the usual way.

The proposal was agreed to unanimously.

It was also agreed to place on record the Institution's appreciation of the honour of knighthood conferred by His Majesty the King upon Mr. Corbet Woodall, to whom also a message of congratulation will be sent.

THE NEW PRESIDENT.

Mr. GLOVER: I have now very great pleasure in introducing to you, in the position of President, my friend Mr. Belton, whom we are very pleased to see here to-day in health and strength, and with good will, to take up the duties of President, which, with some amount of relief, and yet of reluctance, I turn over to him, with every confidence that they will be discharged with credit to himself and satisfaction to us all. I trust that Mr. Belton will find his duties pleasurable as well as responsible; and I wish him joy in his work.

THANKS TO THE PAST-PRESIDENT.

Mr. BELTON then took the chair, and moved that the heartiest thanks of the Institution be accorded to Mr. Glover for his able, and, he might say, brilliant, occupancy of the chair during the past twelve months. He moved the resolution with very great pleasure, because he had known Mr. Glover for a good many years. He knew him by reputation long before he had the pleasure of meeting him; and the good things he heard of him and his brother then made him feel that an acquaintance with Mr. Glover was a desirable one to form, if he should ever have the chance. Mr. Glover had done a great deal for the benefit of the Institution during his year of office. They were indebted to him for the opportunity he had given them of observing the latest improvements in carbonizing plant, and for his able contributions to papers and discussions.

Mr. J. W. MORRISON (Sheffield) said he had great pleasure indeed in seconding the vote of thanks. The Institution had benefited considerably by the tact and discretion Mr. Glover had exercised in controlling their affairs; and in this way he had made it difficult for anyone to follow him.

The resolution was carried with acclamation.

Mr. GLOVER, who was again loudly cheered, said it was very gratifying to him to have this vote of thanks, and to hear words spoken so heartily and note the members' cordial approval of them. He thanked them very much for the honour they did him in putting him in the chair, and for the opportunities it had given him of serving the Institution and its members. In whatever measure he had served, he had enjoyed the service.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

My first word to you this afternoon must be one of sincere thanks for the honour conferred upon me by your electing me to the chair of this important and influential Institution. If I had not already experienced the fraternal consideration which has always characterized the relations between this Institution and its

members, and, indeed, has not infrequently been displayed towards many in our profession outside its membership, I should have cause to be in a somewhat apprehensive frame of mind. As one looks back at the array of men of eminence in the gas world who have in the past occupied the position to which you have now called me, one cannot hope in any degree to emulate their high achievements, or to add lustre to the traditions of the chair.

The Institution has done its full share in the past towards the accomplishment of the purposes which inspired the formation of the District Associations. It has always worked steadily, energetically, and consistently in the direction of promoting and assisting, by every means at its command, individual and collective scientific knowledge and practical efficiency, and of elevating the profession and our great industry to their legitimate status in the public estimation. It was fitting, therefore, that the British Commercial Gas Association—combining, as it does, the forces which make for the future prosperity and progress of the gas industry—should hold its inaugural conference in the city which is the centre and headquarters of our Institution, and has been the birthplace of so many progressive movements in the past.

A NATIONAL GAS INSTITUTE.

It is absolutely impossible to separate the interests which the British Commercial Gas Association has been formed to promote from those which every existing Association of Gas Engineers has at heart; and I believe the time must, and will, come—perhaps at no distant date—when the labours of those who have toiled, and are still toiling, for solidarity of organization and effort will be crowned and rewarded by the amalgamation of this new Association, and the Society of British Gas Industries, with the Parent Institution, so forming a comprehensive, capable, and vigorous National Gas Institute, working, if need be, in well-defined sectional fields of activity, but presenting to our rivals and the public an undivided organization, steadily aiming at the development of our great industry in the direction of highest efficiency and widest usefulness. This most desirable development can best be hastened by the resolute and unswerving determination of all concerned to avoid in the future the shoals and quicksands which made shipwreck of the earlier attempts to harmonize the dual interests involved.

One argument in favour of such a composite Institute—though by no means the most weighty one—may be drawn from the obvious advantage of approaching gas committees and boards of directors for a single substantial contribution in support of the general work of the Institute, instead of for separate subscriptions for different organizations having the same ultimate object—viz., the advancement of the interests of the gas industry as a whole. The practice of making such contributions upon a scale based upon the output of each undertaking would probably be more readily and generally accepted than it now is; and the allocation of this central fund to the various departments of the Institute's activities might be in the control of a permanent representative Committee.

Such a concentration of our forces should not be impracticable, in view of the fact that to-day we have the supreme satisfaction of seeing the three sections concerned being presided over by the same capable, experienced, and universally esteemed leader. While we unite as one man in our hearty congratulations to Sir Corbet Woodall upon the well-deserved distinction we rejoice has been bestowed upon him, our pleasure at seeing his merit recognized by the King is enhanced by our satisfaction that the important interests over which he presides are in such trustworthy hands.

THE RESIDUALS INQUIRY.

I cannot pass away from this subject without alluding to the magnificent service rendered to the gas industry and to the public by the recent combined action of the Gas Companies' Protection Association, the Institution of Gas Engineers, and the Association of Municipal Corporations, in successfully combating the craft and subtlety embodied in the attempts of the chemical manufacturers to cripple our industry and inflict further indirect taxation upon an already overburdened people. If the Gas Companies' Protection Association had not already fully justified its existence, the brilliant victory achieved in the result of the inquiry before the Joint Parliamentary Committee has placed its claim to the confidence of all gas companies beyond dispute. For the wide importance of the interests involved in that encounter of mighty industrial forces, and the far-reaching effects of the victory gained, the "Residuals Inquiry" deserves to rank on a par with any of the "Decisive Battles of the World."

But the fruits of many an important victory have been lost by the supineness of the victors in not following up their success; and it behoves all those gas companies and gas authorities whose interests are affected by the recent imposition of restrictions to lose no time in seeking the remedy which the momentous decision of the Parliamentary Committee has put within their reach. No one who has in the future to seek parliamentary powers should fail to profit to the fullest extent by the removal of the barrier to the complete commercial development of his undertaking.

EDUCATION OF GAS-FITTERS.

The movement for the education and improvement of gas-fitters has been long needed, long talked about, and slow in coming to fruition; but the splendid work done by Mr. Kendrick, Mr. Hudson, and others, in obtaining a definite formulation of proposals and putting forward a practical scheme, has at last lifted the subject into the current of public opinion which will carry it to organized success. Much has already been done, but still more remains to be achieved; and while we "make haste slowly," we must not allow this matter of vital interest to our industry to rest, until it is made illegal for any man to undertake gas-fitting work who is not in possession of a certificate of capability. The faulty work and inadequate provision of the plumber-*quasi*-gas-fitter have, from the beginning of our industry, been one of the greatest obstacles to the development of gas consumption; and it was high time that effective measures should be adopted to safeguard the interests of producer and consumer. That there should be opposition to drastic reform on the part of those tradesmen who dabbled in gas-fitting and the supply of gas appliances as a secondary adjunct to their nominal business, was to be expected; but it is gratifying to the promoters of the new departure, and creditable to the trade associations affected, that this opposition has been confined to a few insignificant individuals, and the trade as a whole has recognized the advantages to be reaped from combined efforts to secure efficiency.

The time has gone by when gas companies and gas authorities could afford to leave undeveloped any likely field of operations, or to treat with indifference the dissatisfaction occasioned by badly-constructed and badly-fitted gas fires and cookers; and while we do not seek to monopolize the business of supplying the public with these domestic necessaries and other useful gas appliances, we have—and must see that we enforce—the right to insist that, when others engage in this business, they shall only introduce serviceable appliances and efficient workmanship. The old-time objection to gas undertakings doing gas-fitting work and supplying gas-fittings and appliances, on the ground of injury to the trade of plumbers and ironmongers, cannot be heeded to-day. The efficient service required by the gas-consuming public must be forthcoming; and, in the presence of the keen competition of rival illuminants, the interests of private tradesmen cannot longer be allowed to cripple the progress of gas lighting. The effective installation and maintenance of incandescent lighting systems in public buildings and private establishments present problems which are beyond the knowledge or experience of the average plumber; and unless these matters are alertly looked after by the gas undertakings, they will soon reap the inevitable results of neglecting them.

This is a subject of immense consequence to gas undertakings, and of no little importance to the public who use gas; for, on the one hand, we cannot afford to lose the business whose continuance is imperilled by incapable workmanship, and, on the other hand, the duty of safeguarding the lives and property of gas consumers from the results of ignorance and inefficiency is an obligation upon gas undertakings which justifies them in seeking the aid of legislation.

AND OF FUTURE GAS CONSUMERS.

There is another subject, not very remote from the education of gas-fitters, which has already received some attention from elementary school authorities. The enormous development of the domestic use of gas, resulting from the introduction of the prepayment meter, has suggested the desirability of a more general diffusion of intelligence with regard to what is a most useful servant to the informed, but often a source of danger to the ignorant. That there should still be found in this enlightened age people foolish enough to search for an escape of gas with a light, or to extinguish a gas-jet by the primitive method of blowing it out, is a fact that suggests the desirability of giving the children in our schools a rudimentary knowledge of the nature and properties of coal gas; while, in view of the wasteful and comfortless methods of so many of the women of our industrial population, it is surely desirable that the girls in the elementary schools should be taught how to use to the best advantage those domestic appliances for cooking by gas and for other purposes which are now available to the means of any thrifty artizan.

Anything which will assist to improve the uncomfortable domestic conditions under which the poor of our country exist, ought to command our interest and support. We live in a selfish age; but it would not be difficult to prove to the most callously indifferent that their own comfort and security would be enhanced by the moral and social uplifting of those less fortunately placed than themselves. We hear sometimes of cases where a once wretched home has become beautiful and attractive as a result of the personal reformation of the man or woman, or both; but in how many thousands of cases the debasement of once decent and self-respecting working-men and women can be clearly traced to the domestic discomfort resulting from the young wife's ignorance of the very rudiments of housekeeping. In a land which boasts of its educational institutions, and where a child's absence from school is an offence visited upon the parents, it ought to be impossible to find thousands of young women incapable of properly preparing food for their household, or of knowing the difference between waste and economy. It is less important for a girl to know how many wives Henry Tudor had, hundreds of years ago, than it is for her to know how to be a good wife to "Henry Smith" to-day.

It is encouraging to know that in many schools something is already being done towards improvement in this direction; but the matter has not received the universal attention which its importance demands. We are as much to blame as the Educational Authorities for the neglect of this essential factor in the training of the young; and it is to be hoped that effective steps

will be taken by the British Commercial Gas Association to procure for this subject the prominence it deserves in the curriculum of every elementary school in the land where a supply of gas is available.

THE LATE STRIKES AND THEIR LESSON.

The historic industrial upheavals of the past two years are not without their lessons to those responsible for the maintenance of so important a public service as gas supply. That neither of the great strikes was marked by destructive outrage on gas-works is matter for congratulation; but the many instances of grave public inconvenience resulting from inadequate provision against the contingency of a stoppage of coal supply, and the still more numerous instances of the bare escape of undertakings from the unfortunate necessity of curtailing the supply of gas, afford matter for serious consideration. The country has had a brief but impressive object-lesson in the mischievous methods of Syndicalism, and the disastrous effect of unrestrained lawlessness encouraged by official indifference to its menace of the common weal. That our large towns and cities escaped the horrors consequent upon being plunged in darkness was chiefly due to the cautious foresight of those entrusted with the conduct of the gas undertakings concerned. Where that foresight had not been exercised, coal stocks became exhausted, and the undertaking suffered discredit by the curtailment or cessation of supply; and the public mind was not a little exercised by the apparent absurdity of seeing places on the coalfields deprived of their gas supply, while towns many miles from the pits were able to enjoy an unrestricted service. If the coal strike has taught them nothing else, it should have finally convinced the advocates of parsimony in the matter of coal stocks that the truest economy lies in the direction of making adequate provision against possible contingencies.

The imperative necessity for maintaining large stocks of coal raises another question—one which has lately received a good deal of attention, and has been ably discussed by Mr. Harman, Mr. Kendrick, and others. The facts adduced in these discussions point clearly to the danger of storing unsuitable coals, and of heaping the stacks to too great a height. The widest difference of opinion surrounds the question of ventilation of the coal-stacks. I am inclined to the view that the stack should not be more than 10 or 12 feet in height, and that no ventilation of the interior of the stack should be provided. The requirements of large undertakings are so great, however, that the question of storage-room becomes in their case a serious problem. If coal stacks are to be limited to a moderate height, considerably more ground space will be required than is now available in the majority of works; and the expense entailed will, it is to be feared, cause many to run the risk again which so nearly proved their undoing last year.

The suitability or otherwise of particular classes of coal for storing in large quantities, and for long periods, is a subject in which we must all feel interested; and your Committee have therefore invited Mr. Lomax (a noted coal expert) to give us the benefit of the results of his researches in this direction. Mr. Lomax has kindly consented to read a paper to this meeting. The handling of coal stocks in works which are not large enough to employ locomotive power, may be cheaply and conveniently effected by means of light portable railways and tipping-waggons. Such a plant is also extremely useful for handling purifying material, and for other purposes, and will soon pay for itself in almost any gas-works.

RETORT-HOUSE WORK.

The subject of coal naturally leads one's thoughts to the retort-house and the various methods now in vogue for obtaining that product of destructive distillation which has become the indispensable servant of every well-ordered household. The development of new methods in carbonization has been more rapid in recent years than during the earlier history of the industry; but there seems to be little probability of the ultimate survival of more than three or four systems. The regenerative system of retort-heating has established its unassailable superiority, and can now be profitably applied even in the smallest works. The use of manual mechanical appliances for drawing and charging in small works has been proved to be economical; and shovel charging is almost extinct. That it should still be practised in any but the very smallest works, is anything but creditable to those responsible for its retention; but unfortunately there exist gas committees who are so shortsighted, and so indifferent to their public obligations, as to tie the hands of their engineers, and refuse to allow the introduction of improved plant and methods into their works.

The first duty of all authorized gas undertakers is to provide their public with an unfailing supply of gas of standard quality; the second and not less obligatory duty is to furnish that supply at the lowest possible figure compatible with the success of their business as a commercial undertaking. What shall be said, then, of the business capacity and the commercial morality of gas committees who refuse to avail themselves of the advance of science, and continue to conduct their works on lines which are proved to be wasteful and extravagant, and do so on the plea that they are satisfied with things as they are, and have no desire to reduce the price of gas lest their electricity venture should suffer, or on the equally groundless and foolish plea that the introduction of modern plant, while it would materially cheapen their commodity, would do so partly by reducing the amount of labour employed? The labour that is displaced by the introduction of mechanical methods of carbonization is not of a class that need go very far to find re-employment in other fields; but even if such were not the case, the larger interests of consumers have first claim to consideration, and these retrogressive committee-men are ignoring one of the first principles of democratic administration in not conducting a public undertaking so as to benefit the greatest number.

The question of weight and duration of charge in horizontal retorts is one upon which much attention has been bestowed, and much discussion will continue to take place. There are so many points of difference, due to local circumstances and requirements, that a system that is working highly satisfactorily in one town might prove a ruinous innovation in another. Undoubtedly, there is much to be said in favour of full retorts and long duration of charge as a means of improving the make per ton and the quality of the coke; but, in many works, to resort to this method would necessitate considerable extension of plant, or the introduction of carburetted water gas to make up the deficiency in production.

Where the size of the undertaking permits the adoption of the latest systems of charging and discharging by power machines, the full advantages of the horizontal system can be obtained; and undoubtedly these are so considerable that they have relegated to the background the claims of the inclined retort, both as regards efficiency and economy. The inclined-retort system, as a new departure, was eagerly adopted without sufficient consideration and experiment; but time has proved that the advantages it presented are counterbalanced by the new difficulties inseparable from its operation, and that a thoroughly good horizontal system, intelligently worked, can produce more gas of better quality and at less cost than the best inclined system.

Those engineers who, not being driven by the necessity for immediate extension, escaped the wave of enthusiasm which marked the introduction of inclined retorts into this country, may congratulate themselves to-day upon having kept open the way for something which can establish its claim to be a substantial improvement upon the horizontal retort system. After making every allowance for too sanguine expectations in regard to economy of labour, increased yield per ton of coal, decreased maintenance charges, and improved working results, there remain solid and unequivocal advantages to be gained by the adoption of the vertical retort sufficient to place it beyond question as the greatest advance in the methods of gas manufacture since the introduction of mechanical stoking.

The immense reduction in the area required for the production of a given make per diem is an advantage of great importance, especially to works in confined areas. The improved yield per ton, of gas and residual products, which is the direct outcome of continuous carbonization in closed retorts, and the undoubted reduction of labour costs, the vastly better quality of the coke, when compared with that produced by the older methods of carbonization—these are outstanding features of a system which possesses, in addition, many minor advantages to which, in the aggregate, considerable financial value attaches. Among these may be named the absence of smoke and noise, the cleanliness of the process, as well as the almost absolute control of the speed of carbonization, the improved quality of the tar, and the absence of stopped pipes and pitched hydraulics. The conditions must be very exceptional which would prevent the adoption of this system proving financially advantageous where an extension of carbonizing plant has become necessary; but in works already possessing a sufficient margin of producing capacity, in a thoroughly efficient horizontal system, it would not be profitable to scrap such plant merely in order to introduce the new principle.

While freely acknowledging the great advance in methods which verticals present, we must not overlook the fact that there are still imperfections to be overcome, and possibly further improvements to be developed. So engineers who are not in the happy position of being able immediately to instal the most modern system, may well possess their souls in patience. The next few years will either permanently place verticals in the front of every other system, or reveal hitherto unsuspected inherent defects which will discount their title to that proud position. That the latter should be the case appears incredible, after an inspection of the fine installations already in operation. Of course, the comparative cost of upkeep and renewals must not be lost sight of. Even verticals will wear out. But they have already endured so long that it is yet too early for reliable data, extending over a sufficient period, to be obtained. It is thus possible (though most unlikely) that when these figures are forthcoming, they will discount to some extent the financial advantages gained in other directions.

But a very substantial gain of another character is already thoroughly established in the decreased amount of labour required. In these days of mischievous agitation and labour unrest, anything which tends to minimize the influence of Socialistic Trades Unionism is a distinct gain to the community; and the vertical-retort system does this, by not only reducing the number of men required in the retort-house, but also ameliorating the conditions under which they labour. It is unnecessary to describe the arduous character of the work that has to be done in operating any system of horizontal or inclined retorts. We are all too familiar with it. Where is the engineer who has not often longed after some method by which that labour could be rendered less exhausting—not to say brutalizing—to his men? Posterity will erect monuments to the memory of the men who have given us a gas-producing plant which can be operated in comparative comfort, which reduces to a minimum the necessity for exposure to the scorching heat of an open retort, and which makes the atmo-

sphere of the retort-house tolerable even in the heat of summer. When once the system is understood by the stokers, they will be eager for the adoption of plant which can be handled without their being drenched with sweat, blistered with excessive heat, and begrimed beyond recognition. The quietness, safety, and cleanliness of the new process will be a strong factor in favour of its general adoption.

At the same time, it must be clearly recognized that verticals require more intelligence for their efficient operation than is possessed—or, at least, is displayed—by the average stoker. There is no doubt that the physical conditions entailed by the older methods of gas-production have a tendency to dull the intellect of the men, and make them wearily indifferent to the many small, but important, details of their duties which they are so frequently found to neglect. But to obtain satisfactory results from vertical retorts, intelligent attention to many minute matters is absolutely essential; and the effectiveness of the system in the direction indicated will be enhanced if those who adopt it are wise enough to offer the men employed a wage commensurate with the new importance of their duties.

CO-PARTNERSHIP CONSIDERATIONS.

Having alluded to the disturbed condition of Labour, I may also refer to the much-discussed subject of co-partnership as a remedy for industrial discontent. The great strides which co-partnership has made since its successful introduction by the late Sir George Livesey must be gratifying to those who were associated with him in applying its principles to the conduct of gas undertakings; and it is a powerful testimony to its value in the estimation of the men that Sir Corbet Woodall has been able to establish it among the thousands employed by the Gaslight and Coke Company.

That there have been a few instances of apparent failure of the system when applied to other industries, is not due to any inherent weakness of the principle, but to local and personal factors, which inevitably make for success or failure in every effort for the betterment of our working population. The success of any scheme of co-partnership depends upon factors which lie at the very foundation of the relations between employers and employed. These factors are: (1) The existence of a mutual regard for each other's interests. (2) A resolute adherence to fair and reasonable conditions of employment and remuneration. (3) A strictly honourable mutual observance of agreements. (4) The exclusion of mischievous outside interference. Where these factors exist as the basis of industrial relations, the introduction of co-partnership has proved successful as a means of improving the present circumstances and brightening the future prospects of the employed; while the employers have benefited by the increased interest of the workers in the efficient rendering of their duties and the general prosperity of the concern.

The history of co-partnership affords ample and convincing evidence of its great value in promoting mutual confidence and good feeling. Those who fail to appreciate or realize its benefits are the intemperate or incapable workmen and the unreasonable, unjust, or avaricious employers. While there are employers (I am glad to believe they are rare in the gas industry) whose only care is the exaction of the greatest possible amount of profit from labour at the lowest possible wage, and employees whose only care is to do as little as possible in the fewest possible working hours, and sit as long as possible in the club or beer-shop wasting time, character, and money in bestial excess, there will be industrial discontent and bad feeling, leading to barrenness and disaster. But where self-respecting workmen and considerate employers unite on the fourfold basis I have described, and work together on the lines of an honest scheme of co-partnership, there the "Industrial Problem" will find a happy solution in the true harmony of the mutual interests of Capital and Labour.

COMPETITION OF ELECTRICITY.

Turning to the subject of electricity as our principal antagonist in the competition for public favour, gas undertakings have nothing to fear from fair competition in the matters of heating, cooking, and public lighting. In these directions, all the advantage in the questions of cost, manipulation, efficiency, safety, and reliability are on the side of gas. In shop-lighting, electricity has one acknowledged advantage in its greater adaptability to decorative purposes; and in domestic lighting its great facility is an inducement to its use where cost is of little importance and domestic hygiene is a neglected science. But in neither of these directions is gas driven out of the field, nor has the last word been said for the advance of science and invention in the improvement of gas-lighting appliances. That so much ground has been lost in the past has been owing more to the alertness of our rivals and the inertness of ourselves, than to any real advantage possessed by electricity. While gas authorities regarded with indifference the inroads made upon their field of operations, the advocates of electricity were making strenuous efforts—not always proof against the charge of mendacity—to gain the confidence of a public who had neither time nor inclination to investigate the soundness of the claims set forth.

A very different condition of things obtains to-day. Lethargy has given place to activity; and the advent of the inverted burner and intensified and high-pressure systems of lighting has greatly assisted to remove the undeserved prejudice assiduously instilled by our unscrupulous opponents. The vast strides made in the construction of gas-engines, gas-cookers, gas-fires, and gas-heating appliances, have prepared the way for the great publicity campaign inaugurated by the new Association; and if gas authorities avail themselves, as they ought to do, of the assistance now offered by the British Commercial Gas Association in the work of making known the uses and advantages of coal gas, its advance to greater and wider popular favour than ever before will soon be the result.

Electricity has utterly failed to justify the claims of its advocates to the confidence of the public. The frequency of breakdowns in supply, sometimes involving whole towns, or large districts and important business centres, in all the inconvenience and danger of sudden extinction of lights, the recurrence of disastrous fires through short-circuiting, fusion of wires, &c., explosions through gasification of insulating material, and the danger to life and limb in the liability to contact with "live" wires, are all making their legitimate impression on a public which is proverbially apathetic, but very much in earnest when it wakes up to the fact that it has been imposed upon. There are not wanting signs of that awakening; and the absurd falsehoods promulgated by the Press advocates of electricity for cooking and heating are doing no little good by exhibiting the lengths to which misrepresentation is carried. If falsehood is palpable in one of their arguments, it will be looked for in others; and there are many statements made by the advocates of electricity in which it will not be sought in vain.

It is a disagreeable subject, and I would not pursue it further; but one cannot ignore the unfair methods by which competition is conducted from that side of the field—such as comparing gas-lighting by obsolete fittings with most modern electric methods (because they well know that the improved modern gas appliances are a long way ahead of electricity as regards efficiency and cost); the supplying of current at prices below cost, in order to bolster up untruthful estimates, and the charging of excessive prices for current for public lighting, with a similar end in view. But a day of reckoning awaits their dubious tactics. Ratepayers are asking why they should be heavily taxed to pay for electricity for public lighting, when it is proved beyond dispute that gas lighting would be cheaper and more effective. Doctors are sounding an alarm as to the dangers to health and to eyesight which threaten the children in our schools, the clerks and assistants in commercial establishments, the family in the home, and the man in the street. These dangers are not imaginary; and public authorities must not suppose that they can long continue to ignore their existence or their effects.

GAS PROFITS AND THE RATES.

The administration of gas undertakings by local authorities presents many objectionable features, and calls loudly for reform The dishonest appropriation of profits filched from the pockets of the overcharged gas consumers, is one of the worst delinquencies. Particulars of eighteen undertakings, taken at haphazard from the last parliamentary returns, show that surplus profits have been diverted from their legitimate object and misappropriated to the relief of the rates, or the assistance of an unsuccessful electricity undertaking, or the erection of new municipal buildings (other than gas offices), or that cloak for a multitude of sins—"The Borough Fund." These eighteen undertakings represent a gas consumption of nearly 10½ thousand million cubic feet; the aggregate of the "appropriated" profits being more than £204,000—equivalent to 4·7d. per 1000 cubic feet of gas consumed. Individual appropriations range from 3½d. to nearly 10d. per 1000 cubic feet. Manchester and Salford are not included in these figures; but both of them take about 2½d. per 1000 feet from their consumers to bolster up other funds.

But for a glaring example of unblushing maladministration, the following instance can hardly be surpassed: A gas committee recommended an increase of over 10 per cent. in the price of gas, to meet the increased cost of coal; the two increases amounting to about the same total figure. In the previous year, this committee had handed over several thousand pounds to "the relief of rates," and now proposed to contribute nearly the same amount again; and they had the effrontery to plead that not a penny of the increase in price of gas would go to the rates, as it would all be absorbed in meeting the increased cost of coal. The flagrant immorality of the whole proceeding was laid bare by the disclosure of the fact that the heaviest ratepayers in the area of supply were users of electricity, and the bulk of the gas consumed was supplied to the working-class population.

Unfortunately, this is not an exceptional case. Several of the returns frankly state that the surplus profits on the gas undertaking are appropriated to meet the deficiency on the electricity works. Thus the poor gas consumers are made to pay an excessive price for one of the necessaries of life, in order that electricity may be supplied at a loss, for the benefit of non-gas consumers, who can well afford to pay a profit yielding price for the light that they prefer. These abuses of public trust ought to convince the Socialist advocates of so-called "popular control" of gas undertakings that the real interests of the classes they profess to represent are far better served when gas supply is in the hands of statutory companies.

BRIEFLY TOUCHED UPON.

There are several other matters I should have liked to discuss; but I have already taken up too much of your time, and must therefore be content merely to allude to them. The controversy aroused by the unfortunate disaster at Ilkeston will have done good if it results in more liberal allowance being made for unknown stresses when determining the strength of material to be employed in such structures. The principle of the spiral-guided

gasholder has suffered no discredit; and I am glad to see that at Belfast (as elsewhere) the confidence of the authorities in its scientific correctness is unshaken, and a 3 million feet holder of this type has been installed.

The use of tar for road surfacing is proving successful, and will probably be even more generally adopted. The profitableness or otherwise of treating the crude tar at the works producing it, must depend to some extent upon local circumstances. The question is one that will no doubt receive attention in our future discussions.

The subject of surface combustion, so ably propounded by Dr. Bone, is one which opens an attractive vista of possible developments, and will repay careful study. It would appear that its application to domestic use may be expected in the near future, and for many industrial purposes is likely to be advantageous.

The working of purifiers on the backward rotation system is now well established. Where it originated, would be interesting to know; but from personal experience I can recommend those who have not adopted it to give it a trial.

There has been a good deal said lately about direct sulphate recovery; and if the methods proposed can be simplified sufficiently to render the process economical, it has attractive features which may well induce experiment on a commercial scale in gas-works.

I will not anticipate the fuller information we hope for the pleasure of receiving from our friend Mr. Allen, on the subject of coke-extinction by the dry process, and the wonderful electric station-meter—two new additions to gas-works plant which his enterprise has lately introduced at Linacre.

The reports of the Commercial Sections are in the hands of the members, and give ample evidence of the great usefulness of their work. There has been a gratifying increase in the membership of our Institution during the past year. May I express the hope that its vitality will be evidenced during the year we enter upon to-day, by an abundance of interesting contributions to our discussions? Our good Secretary will be delighted to receive promises of papers from members.

Just one word before I close, upon a matter which many of us have at heart. Your Committee have again recommended a contribution from the funds of the Institution to the Benevolent Fund of the parent Institution; but they are anxious that this vote should not be regarded as relieving individual members of their obligation to support so deserving an object. And I appeal to all those members who do not already contribute, to do something—according to their ability—to place the Benevolent Fund on a firmer footing.

The great stimulus which our industry has received from the invention and research of the last few years, the development of new fields of usefulness for gas, and the growing prospect of better prices for our residual products, all point in the direction of a most hopeful future; and when the visions we now have of continuous and improved processes of manufacture have become materialized into practical achievement, the day will have dawned when gas-works will no longer be regarded as a nuisance, and the smoke problem will have found its true solution in the substitution of gaseous for solid fuel.

Thanks to the President.

Mr. Watson, in moving a vote of thanks to the President for his admirable address, said it was with the greatest pleasure that he did so. Mr. Belton had taken the opportunity of dealing with present day matters, and had hammered them in. He had spoken of the education of gas-fitters and of gas consumers; he had also referred to co-partnery, which, if not spreading so quickly as some of them would like, was extending, and was likely to be of great use to the gas industry as well as to the employees. The address showed that Mr. Belton had given a great deal of thought to the various topics upon which he had touched; and towards the close of his address many more subjects were named—subjects on which they might draw upon him for advice and help in the future. At the beginning of his address he (Mr. Belton) had alluded to the fraternal character of the relationship existing between members of the Institution. The fraternal spirit which pervaded the Institution was very creditable to every member; and if it had given the individual a chance of knowing his fellow-members, it had given them the opportunity of knowing which man to put in the chair. He thought Mr. Belton's reference to the fraternal spirit of the Institution might be taken in another way; for it was through their association with him, and their knowledge of the work he had done for the Institution by his contribution to papers and debates, that they had been guided to place him in the position he now held.

Mr. Kendrick said he had the greatest pleasure in seconding the motion. Mr. Watson had so well covered the ground that very little remained for him to say, except to thank Mr. Belton, on his own and other members' behalf, for the masterly survey of gas matters to which he had treated them. Mr. Belton had shown his capabilities in the chair; and members would look forward to a most profitable year under his presidency.

The resolution having been carried with cheers,

The President briefly, but warmly, acknowledged the compliments paid to him.

Constituents of Coal and the Microscope.

Mr. James Lomax, of Bolton, who has won considerable fame as a geologist and microscopist, read a paper on "Coal and its Constituents as Revealed by the Microscope." The paper was illustrated by a series of lantern slides. With these pictures and his remarks Mr. Lomax showed how the qualities of coal for gas making or for any other purpose might be ascertained. His view is that the microscope will perform this task more effectively than the chemist.

Thanks to Mr. Lomax.

The President moved a vote of thanks to Mr. Lomax for his paper, and expressed the hope that at some future time the members might hear more of the matter dealt with.

Mr. Glover, in seconding the motion, said that in Mr. Lomax they had an example of persistent perseverance in doing the work to which he had set his hand. He was known throughout the world. He was celebrated for learning how to do better than anybody else had done before the work that had to be done in preparing sections of coal for microscopic examination and exhibition, as they had seen them that afternoon. Mr. Lomax discovered how to do it. A learned professor wrote to him saying: "I congratulate you on what you have done. How did you do it? What have you used?" The great professor apparently thought that Mr. Lomax would be carried away by the enthusiasm of the congratulation, and at once "blab out" his knowledge. But he did not. He wrote asking whether, if the positions had been reversed, and the professor had discovered a way, would the information have been vouchsafed to Mr. Lomax for the asking. He congratulated Mr. Lomax on his patience and skill in revealing to the world, more than ever before, the works of the Creator in the coal measures.

The resolution was passed with much heartiness.

Mr. Lomax expressed his appreciation of the vote. Alluding to the question of gob fires in coal mines, he said the deeper the workings the greater the danger of these fires, for there was a certain kind of humidity with gas from the rocks that helped to make the fires. There were some seams in the Barnsley district concerning which he had to say that if certain bands in them were disturbed, it would be impossible to prevent gob fires, unless all the stuff was brought out of the pit.

Thanks to the Officers.

Thanks were accorded to the officers of the Institution for their services during the past year—especial mention being made of their "dear and esteemed old friend and Treasurer" (Mr. Newbigging), and their "worthy and most efficient Honorary Secretary" (Mr. Whatmough).

The President moved the resolution; Mr. S. Shadbolt seconded it; and it was carried unanimously.

Mr. Whatmough briefly replied.

President's Reception.

Tea was then served. It was followed, as usual, by the President's reception. There was a little speech-making, and some agreeable singing. Mr. Glover proposed the health of the President. The President replied, and proposed the health of the Secretary. Mr. T. Duxbury (Oldham) proposed success to the British Commercial Gas Association and the Society of British Gas Industries; and Mr. Fred J. West (Manchester) replied. The Press was also toasted, and the compliment appropriately acknowledged.

Place of Next Meeting.

The President stated that the next meeting would be held at Chester, on the 31st of May; and that the Directors of his Company would give members a cordial welcome.

Masonic.—At the regular meeting of the Northern Star Lodge, No. 5053, held at the Midland Hotel, Manchester, last Friday, Bro. S. Meunier, S.W., was elected W.M. for the ensuing year, and W. Bro. W. Watmough was re-elected Treasurer. The W.M. (W. Bro. Fred. J. West) completed his year of office by initiating into masonry Mr. Samuel Glover, of St. Helens.

Loans for Reinforced Concrete Construction.—The Concrete Institute have formed a Special Investigation Committee for the purpose of considering the action of the Local Government Board with respect to loans for reinforced concrete construction, and the Committee will be pleased to have any information which can be furnished upon the matter. Among other things, they are desirous of obtaining information as to specific cases in which the Board have refused to grant a thirty-years' loan period, or have granted the full period. Communications should be sent to the Secretary of the Institute, Mr. H. Kempton Dyson, Denison House, No. 296, Vauxhall Bridge Road, Westminster.

History of Gas Lighting in England.—At a meeting of the Illuminating Engineering Society to be held in the rooms of the Royal Society of Arts on Tuesday, the 11th prox., a special lecture, dealing with the "History of Gas Lighting in England," will be given by Mr. W. J. Liberty, in recognition of the centenary of the introduction of gas for public lighting. The Council of the Illuminating Engineering Society have extended a general invitation to members of the Institution of Gas Engineers to be present at this meeting; and the Hon. Secretary (Mr. L. Gaster, No. 32, Victoria Street, S.W.) would be glad to send tickets to any other members of the gas industry interested in the subject. It is expected that a very representative collection of historic illustrations and exhibits will be shown.

PROGRESS IN BYE-PRODUCT RECOVERY AT COKE-OVENS.

By J. E. Christopher.

In preceding issues of the "Journal" [see *ante*, pp. 106, 174], reference has been made to a paper read by Mr. J. E. Christopher, before the Manchester Section of the Society of Chemical Industry, on "Progress in Bye-Product Recovery at Coke-Ovens." The full text of the paper, with a report of the discussion, is contained in the issue of the "Journal" of the Society for the 15th inst.; and from these we are able to supplement the particulars previously given.

Early Methods of Coking.

In his introductory remarks, the author points out that at the present time the chief outlet for coke is the iron industry, which uses approximately three-fourths of the entire production. According to Percy [*vide* "Fuels"], the use of coke had become general in 1870; so that it may be assumed that the industry advanced from that period in proportion to the output of the iron trade. The earliest method of coking was on the lines of the old charcoal pile, but was extremely wasteful. Attempts were next made to confine the air supply to channels more under the control of the coke burner. This gave place to ovens of the enclosed type, leading up to the modern beehive oven. The first attempts in this country to recover bye-products were made in 1859 by Jones, who proposed to draw off the vapours from the old type of coke heap through a "series of metal pipes or condensers such as are used in the manufacture of gas." About 1870, extensive trials were made by Messrs. Bell Bros. and the Wigan Coal and Iron Company of the Pernolet type of coke-oven. The type put down by the latter firm was a modification by Young, in whose patent the gases were drawn off just above the coal by an exhauster. After passing through a bye-product plant, the waste gases were fed into the furnace underneath the oven and burnt; the products of combustion thence passing through a casing enclosing the dome, and finally passing to the chimney. Aitken and Jameson also endeavoured to adapt the beehive oven for the recovery of bye-products—both following the plan of downward suction. All these early adaptations failed on account of the doubtful quality of the coke produced. In the non-recovery beehive oven, the tarry vapours had to pass upwards through the layers of hot coke, depositing part of their carbon by decomposition, and helping to cement the whole, giving finally hard silvery beehive coke.

In the Pernolet, Aitken, and Jameson ovens, the vapours were drawn away as fast as produced through the cooler layers, and no deposition of carbon took place. The portions of the charge farthest removed from the source of heat were distilled very slowly, and by the time the heat reached them their coking properties would be considerably lessened. The Pernolet oven was rightly designed, in that the chamber was kept enclosed and air excluded as much as possible. But the distillation was, after all, a low-temperature one; and consequently the tars produced were thin, containing a large percentage of paraffin bodies, while the sulphate yield was low.

According to Richards [*vide* "Treatise on Gas Manufacture"] gas-works in 1877 produced 10 gallons of tar and 16 lbs. of sulphate of ammonia per ton of coal. The condensing surface works out at about 1 square foot per 1000 cubic feet of gas per day; while the saturator, owing to the inefficient "spreading" of the gas, must tend to losses in yield, as well as local alkalinity. However, a development of the Pernolet oven was erected at the Shamrock Pit, Westphalia, in 1886, in which a regenerative system was used. The charges were coked in comparatively shallow layers, and the quality of the coke was satisfactory. The condensing plant was efficient; and the yield is quoted by Lunge, in his "Coal Tar and Ammonia," as 5 per cent. of tar and 1 per cent. of sulphate of ammonia.

The disadvantage of coking in comparatively deep layers, especially with lean coals, being now apparent, attention was drawn to the methods of heating the ovens; and the Coppée oven was introduced—bringing about considerable improvement in this respect. The Coppée oven is of the retort shape; the charge being heated on both sides simultaneously. Thus the heat had to penetrate a much reduced thickness of coal, and the carbonization was much more rapid. The yield of coke was likewise increased, as the surface of the charge exposed to the air was in small proportion to the whole mass. In 1873, thirty of these ovens were in operation near Sheffield; and in 1874, sixty more were built at the Ebbw Vale Iron-Works. Hard metallurgical coke was made in these ovens; and the advantages of the retort-shaped oven began to be realized.

Modern Bye-Products Ovens.

Thus, from a combination of the Pernolet type of oven, with its enclosed chamber and external heating, and the Coppée oven, with its narrow chamber rapidly heated, we arrive by gradual stages at the modern bye-product retort-oven. The first attempt at this combination was in the Knab oven, modified by Carvès; and it is interesting to note that in these early stages the late Dr. Angus Smith strongly advised the adoption of the Knab-Carvès oven. In his reports for 1877 and 1878 under the Alkali Acts, he described the coking processes of his day as "having all the appearance of roughness and savagery which extravagance always possesses. In 1881, the Carvès oven, modified by Mr. Simon, of Manchester, was introduced into this country; and the first Simon-Carvès plant thus came into being. From the point of view of the bye-products, the results were very encouraging; the yields being 6·12 gallons of tar and 28 lbs. of sulphate of ammonia per ton of coal.

Shortly after this, the Semet-Solvay oven was brought out. But for some time the bye-product oven made little progress, owing to the prejudice of the ironmasters against the appearance of the coke. As soon, however, as this prejudice was overcome, the oven made phenomenal progress. Modern types are the Otto-Hilgenstock regenerative oven, the Koppers regenerative oven with individual regenerators for each oven (adapted for producer gas if necessary), and the Semet-Solvay oven with the continuous regenerator system, somewhat on the lines of gas-works recuperation systems. Some of the last-named type of oven are now being built in the United States, holding up to 16 tons of coal per charge, five and six flues high, and carbonizing this quantity well within the 24 hours.

Working of Modern Coke-Ovens.

Referring now to the actual plant for the recovery of bye-products from any of the modern coke-ovens, the general system up to quite recently has been one of cooling by air and water-cooled condensers, tar extraction by impact or washing, and absorption of the last traces of ammonia by means of water in ammonia scrubbers. The object is to bring the temperature of the gas down gradually to 25° C. before passing through the ammonia scrubbers. The bulk of the tar is deposited by simple cooling; leaving a comparatively small proportion to be dealt with by the tar-extractor proper. The ammoniacal liquor is worked-up into sulphate of ammonia or concentrated to a strength up to 17 per cent. In this "water-absorption" process, the whole of the moisture mechanically held in the slack is condensed, along with the water produced by the combination of its elements in the coal. This forms the basis of the ammoniacal liquor, which is further increased in bulk by adding cold water to the scrubbers.

Taking the average of eleven coke plants as given in the Forty-Second Report of the Chief Inspector under the Alkali Acts, we find the total quantity of ammonia in the liquors to be 0·859 per cent. If we take a basis of 1 per cent. of nitrogen in the coal, and a conversion of 16 per cent. of this into ammonia, we should find that this percentage represents a total weight of liquor of 22½ per cent. of the weight of coal charged into the ovens, or approximately double the amount produced unavoidably from the moisture in the coal. The cooling of the gas down to 25° C., as well as the distillation of this added water, represents a serious disadvantage in the economy of the process. A further loss (amounting to 3 to 5 per cent.) is entailed in the exposure of liquor to the atmosphere. These disadvantages have been partially or completely eliminated in the newer forms of ammonia plants, which may be classed as semi-direct and direct. In the semi-direct processes, the moisture in the slack and the water of formation is condensed and treated in the usual ammonia-still. The ammonia vapours evolved are led into the gas-main, and the mixed gas and ammonia are drawn or forced through sulphuric acid in a specially designed saturator. In the Koppers process, the gas is heated slightly before being admitted to the saturator to prevent condensation of water vapour in the bath. In the Mont Cenis process, as now adopted by the Semet-Solvay Company and the Coppée Company, this object is attained by drying the ammonia vapours from the still in a dephlegmator. The tar in these processes is finally removed by a Pelouze and Audouin tar-extractor.

The semi-direct processes, so far as economic conditions are affected, do not compare with the truly direct processes; but they offer the great advantage of being more readily adapted to existing plants. In the direct processes, the gas is maintained at a temperature sufficiently high to prevent condensation of water vapour. This temperature varies with the moisture contents of the coal; so that in coke-works practice it is in the vicinity of 80° C., while in gas-works practice the dew-point is nearer 70° C. At this temperature the tar is removed by (*a*) a tar spray (Otto process) (*b*) bubbling through hot tar (Semet-Solvay process) or centrifugalizing (Simon-Carvès process). The writer has seen the first two processes in operation in Germany and Belgium, and in all cases the sulphate would pass muster as good grey salt. The Simon-Carvès process is on the lines of the original direct process of Brunck (1903), in which a centrifugal fan was used to extract the tar. The Simon-Carvès system aims at a primary removal of the heavier tars in a cyclone extractor, without any moving parts, leaving the lighter tars only to be dealt with frictionally. This appears to be on the right lines when we consider the difference in the tars that are produced by cooling coke-oven gases to various temperatures.

These truly direct processes offer tempting advantages, as far as thermal losses are concerned; and where the gases are kept above the dew-point of water up to the point of combustion at the ovens,

no condensation, and consequently no effluent, is produced. Under such conditions, the direct processes are at their best; but no account of the benzol side of the question is included in these conditions; and the aspect somewhat changes where benzol is to be recovered. For benzol recovery, the gases must be reduced in temperature to about 25° C.; and the water vapour condensing would give an effluent which would, however, be clear, and only half the bulk of the older water absorption systems. [The author gave a table prepared for comparative purposes only; the results for each type of plant being calculated from the same tables and formulæ, &c.]

Tar Distillation.

Tar distillation is now receiving more attention at the hands of the coke-oven designers; and several coke-oven firms are also erectors of tar plants. In a coke-works plant of the Evence Coppée Company, a saving of fuel is brought about by driving off the water and light oils in a primary still heated by the vapours from the latter portion of a distillation. A new type of tar-distilling plant—the Hennebutte process—is now being put down by the Coke-Oven Construction Company, of Sheffield, to whom the writer acknowledges his indebtedness for particulars.* Several plants of this type exist on the Continent, but as yet only one in this country. The tar receives a primary heating from an enclosed steam-coil, and passes on to the still, into which air is injected under such conditions that some of the hydrocarbons are partially deprived of hydrogen which combines with the oxygen of the air employed; the heat liberated in the reaction being amply sufficient to supply the necessary heat for distillation.

Benzol Production and Utilization.

Little change may be observed in the design of benzol plants. The tendency at the present time leans towards the production of the refined products at the coke-works. Benzol has attracted considerable interest in the motor industry; and a large quantity of the washed is annually exported for this purpose. Repeated trials have shown that there is no serious obstacle to the use of the refined product, which gives a greater mileage per gallon. While benzol requires a slightly higher initial temperature, its range of vaporization is not so extended as with petrol.

Outlets for Bye-Products.

The outlets for the sundry bye-products are of vital importance. In 1900, the world's output of sulphate of ammonia was less than 500,000 tons. It is now upwards of a million tons; and it would be natural to expect that with this rapid rate of increase the price would be materially affected. However, prices have been maintained in spite of this increased output, and of the quantity of rival fertilizers made artificially from atmospheric nitrogen or calcium carbide. The use of sulphate of ammonia in this country does not appear to have made headway in comparison with the quantity used by our Continental neighbours; but the Sulphate of Ammonia Committee are carrying on active and useful propaganda work to encourage the home farmers in the use of this home-manufactured product. There is plenty of scope for this work when we consider that out of our production of 369,000 tons, only 70,000 tons are used in this country, while practically the whole of the German production is used on German soil. An average wheat crop removes 48 lbs. of nitrogen from an acre of soil per annum. On this basis, the wheat alone grown in the country extracts annually from the soil nitrogen equivalent to more than half our total output of sulphate of ammonia. The outlets for tar also appear promising. The advent of the motor-car has introduced a demand for harder surfaced and dustless roads; and large quantities of prepared tar are sold for tar macadam and for waterproofing roads, &c. The Diesel engine also presents possibilities of expansion in the demand for tar products. The output of tar in 1910 was approximately: Great Britain, 990,000 tons; Germany, 822,617 tons; United States, 331,516 tons. Benzol is in good demand at the present time; and, apart from its use in the aniline and solvent industries, its outlet must lie in the direction of motor spirit. The following figures represent the imports of petroleum spirit into the United Kingdom: 1905, 19,459,010 gallons; 1906, 26,335,120 gallons; 1907, 33,180,480 gallons. Assuming an average yield of one gallon of motor benzol per ton of coal, the bye-product coke-works of this country could turn out 19 million gallons annually; so that the field for the exploitation of benzol as motor spirit is extensive, and offers reasonable possibilities for expansion in this direction.

Utilization of Surplus Gas.

We now come to the question of surplus gas. Modern ovens may be divided into the "waste heat" and "regenerative" classes; the former giving a yield of spare gas varying up to 30 per cent., the latter rising to 60 per cent.—these figures being dependent on the amount of volatile matter in the coal. This gas up to recently has been largely burnt under boilers—giving a lower efficiency than could be obtained by using it in gas-engines. The comparison in efficiency is generally quoted about 2 to 5; but with the latest developments of surface combustion introduced by Dr. Bone, along with the modern types of steam-engines, the efficiencies would be nearly equal. Where a plant is well situated for the sale of power, a regenerative type would be advantageous; but with plant somewhat isolated a waste-heat type is more serviceable.

* This plant was described and illustrated in the "Journal" for July 9, 1912 (p. 121); and abstracts of the specifications of the patents taken out for it appeared on July 17, 1906, and Dec. 17, 1907.

The author gave a diagram to illustrate the gradual change in the composition of coke-oven gas, averaged from various sources. It showed that the gas from the first half of the coking period is much richer than that from the second, and by taking the rich gas in a separate main, there would be no difficulty in supplying gas to meet the required standards. But it is his opinion that a modern coke plant, given the same quality of coal as that supplied to gas-works, could, with reasonable care, turn out regularly an average gas suitable for the modern conditions of lighting. On the Continent, owing to less stringent statutory regulations, this branch of modern coke manufacture has made considerable headway, as shown by the following figures, in millions of cubic feet, of the quantity of gas produced at coke-ovens in the Ruhr district of Germany: 1903, 13; 1905, 24½; 1907, 77¾; 1908, 400; 1909, 843; 1910, 1472; 1911, 3020. In the United States, the quantity of spare gas sold from coke-ovens amounted to 12,000 million cubic feet in 1910—23 per cent. of the total output.

A company has been formed, and contracts have been entered into, for the supply of coke-oven gas to the existing municipal gas-works at Ghent.* The gas is to be supplied from ovens of the Semet-Solvay system, and the contract is for 105 to 210 million cubic feet per annum at a price equivalent to 5·4d. per 1000 cubic feet, while power is also to be supplied at 0·33d. per kilowatt-hour for a guaranteed consumption of 3 to 6 million kilowatt-hours. It is not suggested by the writer that gas manufacture in coke-ovens will ever displace the modern vertical retort, with its advantages of continuous carbonization; but an attempt has been made to show the value of coke-oven gas as a bye-product pure and simple.

[At the close of the paper the author gave a diagram showing the relative values of products obtained at a modern coke plant and gas-works respectively. The following are the percentages: Coke-ovens—Coke, 60; bye-products, 25; gas, 15. Gas-works—Gas, 67; coke, 22; bye-products, 11. He also gave an interesting bibliograph of the subject dealt with.]

DISCUSSION.

Mr. H. J. Bailey said the author in the early part of his paper referred to the fact that in former times coke was of very poor quality, and suggested as a reason that the gas did not give up its graphitic carbon in decomposition because it was drawn through the colder portions of the coke. He himself rather thought that the whole question of coking coal was to get the coal properly fluxed. The old idea was that the coking of coal depended upon the decomposition of the volatile hydrocarbons; it being supposed that they represented the sap of the parent plants, and that the fixed carbon, or coke, represented the woody fibre. This idea was somewhat exploded by the fact that there were coals in this country and in other countries of very high volatile content—over 30 per cent.—which it was impossible to coke; and if coking were dependent upon the amount of volatile hydrocarbons, one would quite expect that these coals would coke equally as well as those in the South Wales district with only their 16 per cent. of volatile hydrocarbons. It was all a question of the quality of the coal and a sort of critical temperature at which the melting-point could be obtained. If the coal did not cohere in the first instance, a hard coke could not be produced. It did not seem possible, in coke-oven practice, to obtain a yield of sulphate of ammonia generally much above 1 per cent. In the paper the percentage of nitrogen available as sulphate of ammonia had been given as about 16 per cent., and the figure for nitrogen as about 1 per cent. In his opinion, one or other of the figures was too low. If the figures were worked out, the average yield would be somewhere between 17 and 18 lbs. of sulphate per ton of dry coal coked; and he thought that generally throughout the country the yield was nearer 20 lbs.—at any rate in the North. Even in South Wales, the yield worked out in some cases above 18 lbs., though the coals had very low volatile constituents.

Mr. W. H. Coleman understood that the import of petrol or motor spirit into this country in 1912 approximated 68 million gallons. He thought it would not be possible to obtain anything like this quantity of benzol. If all the metallurgical coke were made in bye-product ovens, 29 million gallons of motor spirit would be an outside figure for the quantity that could be produced; and this was assuming that the whole of the coal would yield benzol equivalent to the yield of benzol from Durham, Yorkshire, and Lancashire coals. He thought Mr. Bailey's criticism of the ammonia yield scarcely went far enough. He was aware that at one or two coke-works it was claimed that they obtained 30 or 32 lbs. of sulphate of ammonia per ton of coal.

Mr. R. H. Clayton inquired what power was required to drive the fans for getting out the tarry matter in the centrifugal process. Such apparatus had to be driven at high speed. How did this matter stand as against the recovery of ammonia simply by condensation, and by plant in which there were no moving parts? With respect to recovery by means of water-washing, the figure given in the paper showed that 36 parts came out of the coal and 50 parts were used to wash out the remaining traces of ammonia from the gas. Fifty parts seemed to be an excessive amount. From his experience of gas-works practice, the amount of added water to finish the extraction of the last traces of ammonia was very much less; and he asked whether the figure represented

* Reference has been made to this project on several occasions in the "Journal."

modern plant. He also desired information with respect to the comparison of the gas-engine and the steam-engine in the utilization of the gases. It had been stated that the utilization by steam was as 2 to 5 by a gas-engine, and that by the surface combustion of the boiler it became approximately equal. He could not understand how the enormous economy resulted which the statement seemed to represent.

Mr. A. L. HOLTON was surprised to hear of the low yields of ammonia. He had been informed by a manager of a coke-oven works in the Midlands that he was getting 30 lbs. of sulphate per ton of coal. Everything was sealed up, and there was no outlet for any ammonia vapours. For the previous six months, he had been specially interested in seeing that the pipes which led the ammoniacal liquors to the liquor-well were trapped or had a hood put on them at the top, so as to prevent any ammonia vapours ascending the pipe. By adopting this practice, the yield of ammonia had been greatly increased. He was not cognizant of the custom in coke-oven practice as to dealing with ammoniacal liquor.

Mr. E. N. ARDERN said the direct process, with non-recovery of benzol, appealed to him personally, for the reason that there was no effluent to be discharged into either the sewers or the watercourses. He gathered from the paper, however, that this process had been practically abandoned, because the recovery of benzol was a profitable process. In regard to the effluent produced in the semi-direct process, was the reduction in the volume of resultant waste-liquor, as compared with that produced in the original water-absorption plant, accompanied by a corresponding increase in strength, or were the effluents obtained in the two cases more or less of similar composition? In other words, did one process possess any advantage over the other in so far as regards the possibilities of pollution?

Mr. JOHN BOND inquired whether the author had had any experience of inclined ovens in regard to the cost of discharging coke from them compared with horizontal ovens. It was shown in the paper that the ammonia made in gas-works practice was equivalent to about 16 lbs. of ammonium sulphate per ton of coal carbonized. He believed the figures now stood at an average of about 24 lbs. He anticipated that when the gas industry used vertical retorts more generally, this yield would be considerably increased.

Mr. E. WHEELER thought some of the speakers had forgotten that different percentages of nitrogen existed in different samples of coal, and were rather inclined to treat coal as being a sort of standard substance. In analyzing many samples of coal from different parts of the world, he had sometimes experienced great difficulty in obtaining an average sample. In some cases he had found a large percentage of shale with varying amounts of nitrogen in the shale, and also varying amounts of nitrogen in samples of coal which came from the same district or even from the same colliery.

The CHAIRMAN (Dr. Gilbert J. Fowler) said they were aware that it was possible to have from ammonia-recovery works a very clear effluent which was by no means harmless, even if all the lime was taken out of it. What was the composition of the effluent, and could it be used, for example, for coke washing?

Mr. CHRISTOPHER, in reply, referred to Mr. Bailey's point as to what really constituted the coking of the coal. According to Professor Vivian B. Lewes, coal treated up to something like 300° C. lost its coking power entirely. His (the speaker's) experience was that the amount of nitrogen varied very considerably, and scarcely two coke-plants dealt with the same percentage of nitrogen. He had known instances of nitrogen down to 0·8 per cent., and others where it went up to 2 per cent. He knew of yields of sulphate which varied from 16 lbs. up to 39 lbs. per ton of coal. He was much obliged to Mr. Coleman for supplying the later figure with regard to the importation of motor spirit; and he agreed that if the whole of the coke in this country were made in bye-product ovens 29 million gallons of benzol could be obtained. Mr. Holton had spoken about the claims for certain coke-ovens obtaining 30 lbs. of sulphate of ammonia per ton; but he thought this had been already sufficiently explained. The losses from evaporation were considerable; and he was afraid that in the case of coke-plants this point was not regarded with the interest it ought to be. The figure given by Mr. Sheard, of the Sheffield Gas Company, quoted in the Alkali Inspector's report, showed that the loss on a clear day amounted to from 3 up to 5 per cent. of the ammonia. The observation about keeping the pipes and tanks closed referred to gas-works liquor, which was usually two or three times as strong as coke-oven liquor, the average strength of which was 0·859 per cent. of ammonia. The effluent from the semi-direct or the direct process contained most of the impurities in a concentrated form. The amount of gas available for power was up to 30 per cent.; the remaining 70 per cent. being used in the coke-oven flues. He was not aware of any coke-oven gas that contained dust; but if it was to be used in gas-engines it certainly ought to be passed through purifiers, as was done on a very extensive scale in a South Wales coke-plant, where a gas-engine had been running for five or six years continuously. The purifiers took up sufficient quantities of sulphur from the gas to be converted into sulphuric acid for use in the sulphate plant—thus creating a very high point of efficiency. As to the area of cooling surface, the 9 square feet, strictly speaking, was the total (representing mains as well). He did not think it possible to go below this figure with satisfactory results in the case of coke-ovens. In reply to Mr. Clayton, he had heard it stated that the power required to wash out the tar in the direct processes amounted to 40 H.P. per hour, calculating on about the same amount of coal. The Simon-Carvès principle removed a good share of the tar by the cyclone extractor, without any moving parts; the above figure being then considerably reduced. As to the excessive amount of water used on a coke-plant, the average he had given was the average of eleven plants; and he thought it could be taken as fairly representative. With respect to the comparison between gas and steam, the average worked out as 2 to 5. As to the storage of coal, he had definite figures from a German gas-works, showing that the loss of ammonia, after eight weeks' storage, amounted to 8 per cent. The effect of storage was very severe on the amount of spare gas. This point would also affect gas-works, as they would have a less turn-out of gas. With coal that had been stored for any length of time, it was quite possible to get no spare gas at all.

CARBONIZATION OF COAL FOR THE PRODUCTION OF LIQUID FUEL.

By ARTHUR DOUGLAS, B.Sc.

The recent outcry against the high price of petrol awakened great interest in the question of the possibility of the production of a suitable fuel as a bye-product in the distillation of coal. Then, too, the marked developments in the construction of oil and gas engines of high power has opened up another outlet for some of the surplus products. A further argument in favour of the more general adoption of oil and gas driven engines is the growing outcry on behalf of a purer atmosphere, and the demand for suitable smokeless fuel.

In present circumstances, there can be no doubt that the maximum possible efficiency is not by any means obtained in the consumption of coal under boilers and also for domestic purposes. In addition, too, all the valuable nitrogen contained in the coal is entirely lost, and much of the thermal value of the coal is lost owing to the deposition of carbon in the form of soot and smoke. There is, then, much room for improvement in the matter of coal consumption from an economic point of view. But at the same time it must be borne in mind that any improvement must be of a distinctly commercial, and not only of a sentimental or hygienic, character. By this is meant that a new process for the production of a smokeless fuel, &c., can only be entertained if in addition it offers a profitable outlook from a commercial point of view.

The demand for a suitable—home manufactured—motor fuel and also suitable tar oils, &c., has revived the question of low temperature carbonization of coal. Originally, the process of manufacture of illuminating gas was such a process. But the tendency in modern times has been to raise the temperature to the utmost limit for the production of the maximum quantity of gas, and an ordinary quality of domestic coke. In the meantime, however, various low temperature processes have been brought out; but none of them has been successful to any extent, possibly owing to the fact that there was only a very limited demand for the oil products referred to above. Now, however, the urgent demand for these fuels has set going investigations in search of suitable processes for their production on a commercial scale; and it is safe to say that in a few years' time a new industry will have been created in this country to cope with the ever-increasing demands of the motor industry. The present known supply of oil is somewhat limited; while the demand for motor vehicles is increasing by leaps and bounds. This demand can only be supplied, and indeed can only exist, as long as a suitable fuel is to be had at a reasonable price. If, therefore, a really good process can be brought out for the production of these fuels, the question of its success will never for one moment be in doubt. As a result of the demand, during the last few months, a few processes for the distillation of coal at a low temperature have been brought out, each having as the primary object the production of a smokeless fuel, a large quantity of tar and benzol, and appreciable quantities of sulphate of ammonia.

The Del Monte process was described a short time ago in the "Westminster Gazette."* In this process, coal slack of low grade is fed continuously into a furnace, and is distilled at a temperature of about 800° Fahr. The tar oils are extracted by condensation and scrubbing. After the extraction of the tar, &c., part of the gas is utilized for heating the furnaces. Another part is again passed into the furnace and through the partly carbonized mass. The effect of this is to remove from the mass a further quantity of hydrocarbons; and these are extracted from the gas in the scrubbers. The yield of bye-products obtained in this process is said to be as follows:—

Coke	75 per cent.
Tar oil	25 gallons per ton.
Sulphate of ammonia	2 per cent.
Rich gas	6000 cubic feet per ton.
Benzol	3 to 10 gallons per ton.

The yields are thus exceptionally high; and it is very doubtful indeed if they can be obtained in actual working on a commercial

* An account of the process and illustration of the apparatus appeared in the "JOURNAL" for Oct. 29, 1912, p. 370; and many of the figures given by our contributor were then reproduced.—ED. J.G.L.

scale. This is particularly the case with regard to the quantity of ammonia likely to be obtained. Carbonized under the best conditions and at the best temperature, 1·5 per cent. of sulphate is a very good yield. At such a low temperature as 800° Fahr., probably 0·5 per cent. of sulphate would be much nearer the mark. This, of course, makes a difference of about £20 in the revenue per 100 tons of coal carbonized—a considerable difference. Say, 25 gallons of tar oil and from 3 to 10 gallons of benzol are also remote possibilities; the more probable yields being 15 gallons of tar oil and 2 to 5 gallons of benzol.

The Richards low temperature distillation process does not claim quite such high possibilities as the above; and also it is designed to deal with low-grade slack. It is a continuous distillation process; the coal dust being taken through the retort on an endless conveyor. The period of carbonization is about 2½ hours, and about 3000 to 5000 cubic feet of rich gas are obtained, of which some 2000 cubic feet are required for heating the retort and for power purposes. The temperature of distillation is about 960° Fahr.; and the yield of tar in this case is approximately 20 gallons per ton of coal carbonized.

It is improbable that, for some years at any rate, such low temperature distillation processes will be put in hand to deal with large quantities of good class coal. Their possibilities lie in the successful exploitation of low-grade material. There are throughout the country vast quantities of such material to be had at very low prices; and to meet with much success, the necessary plant must be such as can be erected at a comparatively low cost. Coal at the present time is a valuable commodity in itself; and if it is carbonized, there are better outlets for the products of distillation obtained in coke-ovens than there would be for those obtained in a low temperature process. The present demand for blast-furnace coke exceeds the supply, and, consequently, high prices obtain—25s. to 30s. per ton being the rule. A coking coal can, therefore, be utilized very profitably in this way. A non-coking coal cannot, of course, be used in coke-ovens, owing to the fact that the residual is practically useless. For the same reason, such coal is not likely to be used for the production of a smokeless fuel. If it were used, the resulting product would have to be made into briquettes by the use of some binding agent, such as tar or pitch; but this operation would be costly, and would detract very considerably from the profit of the undertaking. If, of course, a low-grade fuel were used, briquetting would be necessary; but the cost of this would be more than balanced by the saving in the purchase price of the raw material.

In the colliery districts of the North of England, there are thousands of tons of such low-grade material available, all of which could be obtained at a nominal price. That the material is of some value is proved by the fact that during the coal strike of 1912 many mills and factories kept going solely by the use of such material. It is not really suitable for use as a fuel owing to its dirty nature and high ash content; but it should not be impossible to extract from it the gas and hydrocarbons which it undoubtedly contains. The writer has tested samples from various localities, and has found them to contain 15 to 30 per cent. of volatile matter. By suitable distillation, it should be possible to obtain from this material sufficient gas for all the heating required for the retorts, steam, and power purposes, and still leave a small surplus, and quantities of tar, benzol, and sulphate of ammonia. Indeed, one sample tested by the writer on a small scale yielded per ton, 6000 cubic feet of gas, 16 lbs. of sulphate of ammonia, 12 gallons of tar, and (estimated) 1 gallon of benzol. The residual product was of the nature of coke, but contained over 40 per cent. of ash. This material in the raw state could probably be bought at about a shilling per ton. For such material, therefore, the introduction of low temperature carbonization should provide a suitable process for its use. The carbon compounds are becoming more and more valuable every year; and the demand will continue to increase for many years to come. The distillation of coal, tar, &c., has on this account a very bright prospect before it; and it is only to such processes that we can look for the solution of the liquid fuel problem of the future.

SOME NOTES ON INDOOR ILLUMINATION.

By J. S. Dow.

Fourth Lecture.

In his fourth lecture, on the 14th inst., Mr. Dow made a comparison between natural and artificial light. He pointed out that the great part of the day's work was still done by daylight, and some kinds of buildings might be mentioned (such as museums and picture galleries), which were lighted almost exclusively in this way. It would appear, too, that the architectural scheme of a building was designed almost entirely with a view to its being seen by daylight; and architects had not as yet studied to any great extent the effect of artificial light on these problems. There were very few cases on record of the nature of a building being especially designed with a view to the system of artificial lighting employed.

It was generally recognized that free access of daylight into rooms was necessary on hygienic grounds—in fact, the Dutch factory laws prohibited women and children being at work in rooms from which daylight was totally excluded. On the other hand, there were special difficulties in connection with daylight illumination, arising from its being so variable—depending as it did on the time of the year and day, climatic conditions, window area and position, the dimensions of the room illuminated, and many other factors.

The chief respect in which daylight differed from artificial light was its uniform high intensity. One might frequently have an illumination ten or even a hundred times that which would be used by artificial light. As a rule, daylight illumination was comparatively unevenly distributed, more especially when coming from windows on one side of a room only. Variations in light occurred which would never be tolerated in a good artificial light installation; but the general order of illumination was usually so high that the eye did not seem to recognize the extent of these variations. Seeing that daylight was so little under control, it was important to design the windows of buildings correctly in the first instance. The Building Acts specified that the ratio of window area to floor area in a room should not be more than 1 : 5. In addition, it was desirable to arrange the shape of rooms so as to get the best light. Thus in the modern London County Council schools a narrow room, with windows down the side, was preferred to a deep one. In the textile factories, narrow, tall buildings with windows on both sides, or even bungalows with glass roofs, were often used. It was especially important, with a view to even, well-diffused illumination, to have walls and ceiling a light tint.

From the study of daylight, the lecturer passed on to the planning of artificially lighted rooms. He pointed out how many were the factors affecting the choice of an illuminant. Very often there were local circumstances that determined the choice, quite apart from questions of cost. In every case it was necessary to consider the exact use to which the room would be put—*e.g.*, whether it was desired to get the same light at every point in the room or whether the illumination was needed specially in certain parts only. In many cases—such as banks and libraries—there was a strong feeling in favour of local lighting by well-screened lamps; some of the best modern installations of this kind seemed to use local desk lamps supplemented by semi-indirect general lighting. A very important point always to be considered was the nature of the shades and reflectors employed. It was often possible to make considerable savings by merely introducing suitable shades, which threw the light where it was mainly needed.

Mr. Dow next put on the screen a slide summarizing the amount of illumination recommended for various classes of buildings. He explained that although such tables were commonly presented by firms interested in lighting, he thought they should be regarded as a temporary expedient merely. As yet it was hardly possible, without exhaustive tests, to say just what degree of illumination was needed for certain classes of work. Take, for example, printing works. Mr. Goodenough's recent paper on this point before the Illuminating Engineering Society had revealed cases in which the same class of work was done under identical circumstances, and yet widely different amounts of light were used. Clearly, either some of these people were using too much light or others too little.

In conclusion, the lecturer showed a series of slides illustrating points mentioned in "Light and Illumination: Their Use and Misuse." These were rules that applied to all illuminants, and they furnished guidance on some fundamental points on which there was substantial agreement. He also gave some data showing how much gas or electricity would, on the average, be needed in order to secure a certain illumination. They were based mainly on figures presented at meetings of the Illuminating Engineering Society, and should be applied to cases in which it was desired to provide an even illumination over a given area. He had also added similar data for acetylene and petrol air gas, but gave them provisionally as requiring further confirmation. Obviously, such rules could not be used too strictly. For example, the results in any installation depended on how much light one could allow to the working plane and how much must be allotted to the walls and ceiling. The following applied to normal circumstances:—

Electric Lighting.

Tungsten lamps and efficient reflectors, 0·5 watt per square foot, 2 foot-candles.

Indirect arc lighting, 1 to 1·5 watts per square foot, 4 to 6 foot-candles.

Indirect tungsten lighting, 0·4 to 0·7 watt per square foot, 1 to 1·5 foot-candles.

Gas Lighting (Low Pressure.)

1½ to 5 cubic feet per 100 square feet illuminated, giving 2 to 5 foot-candles.

Acetylene.

1 cubic foot per 100 square feet gives 1 to 1·5 foot-candles.

Petrol Air Gas.

1 gallon of petrol per hour will give 20,000 lumens—*i.e.*, would provide 2 foot-candles over 20,000 square feet.

The members of the Eastern District Division of the Scottish Junior Gas Association will visit Cowdenbeath on Saturday next. They will meet at the gas-works, and after inspecting them will visit the miners' rescue station, the mining school, and the burgh electricity station. The Directors of the Cowdenbeath Gas Company have arranged to entertain the members at tea in the Crown Hotel. The joint visit with the members of the Western District Division will be to the Stirling Gas-Works (instead of to Coatbridge), and will take place on the 22nd prox.

SHOP LIGHTING: HIGH AND LOW PRESSURE.

By W. Dawes, of Castleford.

[A Paper read before the Yorkshire Junior Gas Association, Feb. 22.]

My paper was originally to have been on high-pressure lighting only; but on second thoughts I came to the conclusion that the subject had been dealt with so repeatedly during the past year, that a paper on my own experience with both high and low pressure would be more acceptable.

The lighting of any shop, to get the best effect, depends upon the class and nature of the goods displayed, and the construction and loftiness of the windows. A pure white light on the goods is the ideal; and whether large or small units are adopted is a matter of opinion. But if the light can be placed out of the direct line of vision, and made to cast no obtrusive shadows, then this is the scheme which should be adopted.

Mr. W. Hole, in his excellent book on "Distribution," divides shop-lighting into four classes, as follows:—

(*a*) Shop Lighting Proper: This class deals entirely with lighting up the interior of the shop.

(*b*) Interior Window Lighting: Shops which should come under this section are meat, fish, fruit, furniture, cycle, or any where the exhibits stand well back from the window, or where the goods are laid on the floor.

(*c*) Exterior Window Lighting: Shops which should come under this section are jewellers, chemists, drapers, tobacconists, grocers, or any where the exhibits are brought well forward to the window. Most of the above tradesmen's windows are cased-in, and some people prefer to light them by means of an ordinary incandescent burner surrounded by an octagonal or ribbed reflector, fixed above the casing, and at the same time do away with outside lighting.

(*d*) Lighting for Advertising.—The question as to whether these shops should be lighted with high or low pressure gas, is one which should not be passed over lightly, but should be well thought about. We all learn by experience; and I have found this out during the last few months. I think, however, that high-pressure lighting is very much over-estimated.

A scheme for high-pressure lighting will, no doubt, first present itself to one's mind; but in case one does not fear competition from "the firm opposite," either at the present moment or in the near future, I personally think one can reasonably stick to low-pressure—especially if the premises to be lighted will not take an installation where a compressor will be found expensive. Where, however, there is electric light at present or possibly in the near future, one may have to put in a high-pressure main, to give a light far beyond the reach of the electric flame-arc lamps.

If a high-pressure main is in the vicinity of the premises, and if the windows are deemed lofty enough to take the high candle power obtained with high-pressure for outside lighting, I think that this system should be adopted.

I have not, as yet, said anything about small high-pressure units. There are shops which do not require outside lights; and then the question arises whether they should be fitted with small high-pressure units or not. This brings me to the first part of my paper:

Internal Lighting.

The first to be considered is whether light is required to a certain extent on the ceiling, or if the shop is of such a character as to require all the light downwards. If light is required up above as well as below, I say, most emphatically, use low-pressure lights, whether you have a high-pressure main or not. My reason for making this remark is that I have found that the maintenance of lamps which require opaline reflectors to be so very high that the extra saving in gas is overcome by the heavy maintenance costs. If light is not required up above, then a high-pressure scheme is practicable, providing that there are sufficient lights to effect such a saving in gas as will overcome any cost for compression. In this case, the units fitted with enamelled shades are much to be preferred.

In a large installation of a few hundred lights—say a mill, factory, or workshop—the saving in gas by the use of small high-pressure units fitted with enamel reflectors would be so great that it would not justify an installation of low-pressure.

I am firmly convinced from my own experience that for internal lighting, high-pressure units with opal shades—that is of less than 500 candle power—should be discarded entirely, as the latest type of low-pressure high-power lamp, giving an efficiency of about 30 candles per foot, mean hemispheric value, with globe and reflector, is much more economical.

It is questionable whether 40 candles per cubic foot, mean hemispherical value, are obtained with small high-pressure units; so if maintenance of these is so considerable, why not use low-pressure units which give us nearly the same candle power per foot as the high-pressure units?

There are several good makes of lamps of the 200 and 300 candle power "Mannesmann" class; but the only one which we have used is the Welsbach "Ruler" lamp. The appearance is somewhat similar, but the internal parts are different.

Outside Lighting. High-Pressure.

When we speak of high-pressure lighting, we have become so used to thinking of one popular system only, that I make no apology for bringing forward another system—the Welsbach "Pharos." This system has been in vogue on the Continent for quite a long time, and the new improved lamp does great credit to the Welsbach Company both as regards its appearance and working costs.

The installation of four 1000-candle power lamps, which we have put down in Castleford, has now been working for nearly six months; and the working costs, which we were told by the makers would be low, have not only proved to be entirely satisfactory, but much better than they claimed. Their maintenance was to have been one globe per lamp per annum and 200 lighting hours for each mantle. Up to the present, we have not broken one globe, and the mantles have averaged well over 320 lighting hours. No other parts have as yet been replaced. The plant used for raising the pressure is a "Bryan Donkin Welsbach" compressor, capable of passing 200 cubic feet per hour, at 54 inches pressure, driven by a 0·75 H.P. gas-engine, and this is also working satisfactorily.

The 1000 candle power lamp consists of an enamelled steel case with an adjustable part A (fig. 1), for suiting the architecture of the building; and the various parts are made of very strong material. The mixing-tube B is made of cast iron; and the burner head is cast-brass, covered with a plate C, composed of an alloy of nickel-chrome-steel—the gas-ways being drilled in such a manner as to prevent lighting-back. Only primary air is used; and the cooling action on the flame by the introduction of cold secondary air is eliminated, as well as an excessive temperature of the mixing-tube.

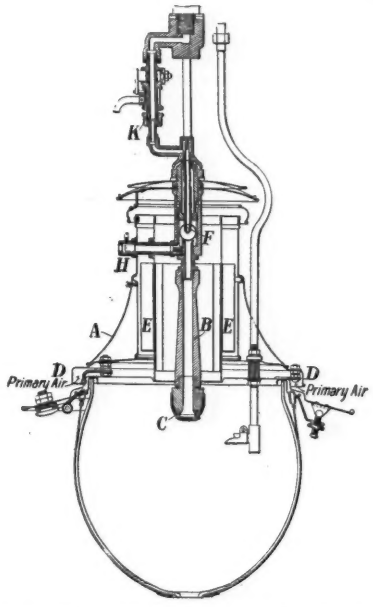


Fig. 1.—The Welsbach "Pharos" Thousand Candle Power Lamp.

At the point D, just above the reflector, the primary air enters, and passes through a ribbed inner chamber E to the nipple F, through which the gas is forced into the mixing-chamber B. The air, in its travel to the point of mixing, is thus preheated by the products of combustion flowing up the external surface of the ribbed inner chamber E—the air being governed at the nipple by the regulating screw H, which is manipulated from outside the lamp. The entrance to the air-channel has a dust-trap, in order to avoid dust particles entering the mixing-chamber.

One of the special features of this lamp is the gas nipple; and to take this from the lamp requires only a few seconds. The backnut K is screwed down; and the nipple is then taken out, cleaned, and replaced—thus effecting a saving in maintenance.

I have just received a telegram from Manchester to the effect that, at the test of the trial "Pharos" installation there, the Welsbach Engineer and Mr. Brocklebank, the Distribution Engineer, found a 4000 candle power lamp to give 4090 candles, or 61 candles per cubic foot, lower mean hemispherical. These tests were carried out on Friday evening; and this Association is the first to hear the result.

Next month the Welsbach Company will put on the market a 1913 pattern lamp specially adaptable for shop-lighting. The same principle is adopted throughout, but the top part of the lamp is much shorter, which gives it a better appearance.

Mantles.

Sometimes the authors of high-pressure papers stick to certain dimensions of high-pressure mantles. I cannot say that I agree with this, because there are so many different factors to cause varying candle power. For instance: (*a*) It makes a lot of difference whether ramie or silk mantles are used. (*b*) How the fabric of these mantles is woven. (*c*) The mixture of gas and air, and the more or less fierce flame—the fiercer the flame, the more the shrinkage. (*d*) Calorific value of the gas. (*e*) Last, but not least, the pressure used. Some firms deliver the same mantles for

54 inches as they do for 80 and 108 inches; showing clearly that one has complaints about the mantles and another finds them satisfactory.

In the "Pharos" system, "soft" single-woven ramie mantles are used; and for the 1000-candle power lamps, the size is 5¼ in. by 2¼ in. This shrinks up to 3 in. by 1¼ in. when lighted. There is a small aperture at the bottom of the mantle; and thus one never sees a mantle blacken in this place. In a low-pressure mantle the waste gases escape through the side and the top of the mantle; but in this case they are driven off to a certain extent through the aperture. The mantle is tied round the clay nozzle with asbestos thread; and this in turn is then screwed on to the burner-head. The mantles are of the "auto-shape," which adapt themselves to the size and shape of the flame.

The "burning-off" of the "auto-shape" or "auto-form" non-collodionized mantle is best done in the following manner: Fix the mantle round the clay mantle-carrier by the asbestos thread, and screw it on to the burner-head. When lighting the lamp, the new mantle will be lighted with the others by the pilot-light, and will form itself at once, and automatically, under the increased pressure. It is necessary to keep the mantle burning a certain length of time in order to have it well shaped and hardened. It is most important not to use damp mantles, as they shrink up too much when lighted. I find one good method of keeping the mantles dry, when not put into an air-tight box, is to put them in a box with a partition. In one space put the mantles, and in the other place some calcium chloride, and I think you will find this keeps them perfectly dry.

Distance Lighters.

The lamps can be fitted with or without an automatic distance lighter. This consists of a weight-laden flexible diaphragm M (fig. 2), the weight, G, of which carries the valve V. When the controller is supplied with high-pressure gas, the lead weight G presses the diaphragm M upon its seating, and closes the passage H. At the same time, the valve V is open and the low-pressure gas passes through the bye-pass channels O and P, away to the pilot-light. When the high-pressure gas is turned on, it passes down the channel K to the underside of the diaphragm M, and,

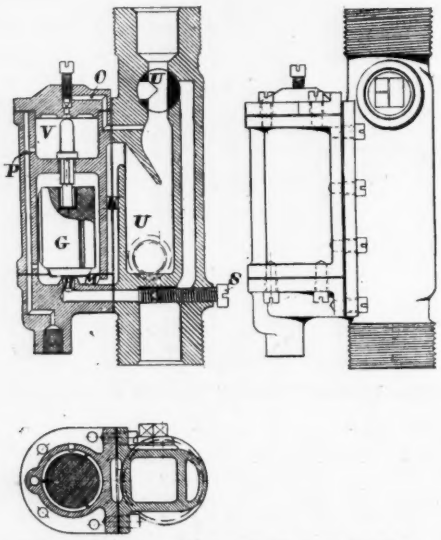


Fig. 2.—The Pharos Automatic Distance Lighter.

overcoming the downward pressure of the weight G, lifts the diaphragm, uncovering the passage H, and passes away to the main burners. The automatic distance lighter has also the bye-pass U, which can be brought into connection with the three-way valve, so that if the lighter should not work, owing to any blocking-up by naphthalene or other particles, the high-pressure gas can be supplied direct to the burner. In this case the screw S must be withdrawn, so as to permit the high-pressure gas free access to the burner.

The Welsbach Company have also designed a new automatic distance lighter (which will be put on the market shortly) for use with their new 1913 pattern lamp. This apparatus is much shorter in length, and it is a combined automatic distance lighter, cock, and governed flashing bye-pass cock, so that it can be used in every case.

In the present type of apparatus, when one wants to change to a bye-pass arrangement only or *vice versâ*, it means men's labour, and this means money. With the new apparatus, it can be used to the customer's own requirements, by merely putting the main cock to the "on" or "off" position. When the apparatus is to be used as an automatic distance lighter, the cock is put to the "on" position, and the lamps are lit by the increased pressure, by merely starting the compressor. But if the governor flashing-cock is only required, then the main cock is put to the "off" position, and the lamps can be lit individually. Up to the present, I do not think that there has been a bye-pass cock on the market for use with high-pressure lamps where the pilot-flame has been extinguished when the lamp was burning. But with this new apparatus the bye-pass does go out; and this is a decided advantage when we consider the cost of a bye-pass burning, more especially in public lamps.

Maintenance Costs.

The maintenance costs of these lamps have been very good. The lamps are cleaned every week, and well looked after—a system which I strongly believe in. Breakage of mantles has averaged 0·5 per lamp in six months; and no new globes have been used. The lighting hours per mantle were about 320.

Outside Lighting. Low-Pressure.

The Welsbach "Emperor" low-pressure high-power lamp, which I am about to describe, is used by quite a number of tradespeople in our town, and also by our local Urban District Council for the lighting of the main street. Every lamp is of the two-light 600-candle power type. The lamp consists of either a copper or enamelled steel casing, A (fig. 3); and, like the "Pharos" lamp, the internal parts are made of very strong material. The mixing-chamber, B, is made of cast iron, to withstand the great heat;

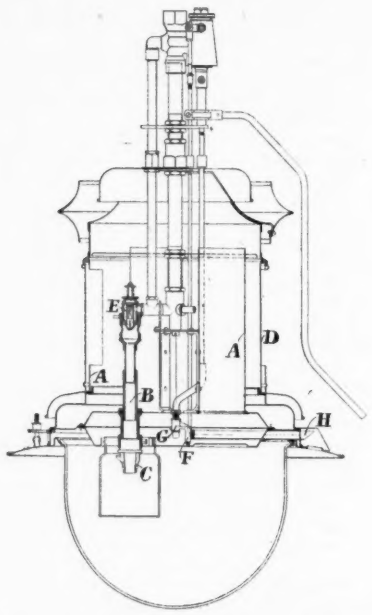


Fig. 3.—The Welsbach "Emperor" Low-Pressure High-Power Lamp.

and the burner nozzle C is of the usual magnesia material, made large enough to take the new six-lock mantle. There is a good chimney draught for the exit of the products of combustion; and this induces a great quantity of primary air into the bunsen tube, which in turn tends to a perfect combustion, with the production of a very high flame temperature, and consequently increased illuminating power. A sliding casing D fits over the inside casing of the lamp; and in this there are two slots for the purpose of obtaining access to the nipple E, to regulate the gas and air and to safely enclose them and render them proof against dust and draughts. Every lamp has only one permanent pilot flame F; and the intermediate ignition of the jet flames G from the pilot flame at F is out of action while the lamp is burning.

One of the most important parts of this lamp is the outside ignition (shown at H). This is fitted to all lamps of the swing lever type. The globe of a lamp fitted with this outside ignition need not be lowered even when the intermediate ignition requires lighting.

On a lamp of this class there are two pointers fixed to the reflector. To light the pilot flame, push the swing lever to the first pointer, when gas streams down to F and G; and, on applying a light at H, the flame flashes-back and lights the intermediate ignition, and consequently the pilot flame. To light both burners, push the lever to the second pointer. To keep only one burner lighted, push the lever past the second pointer and one is extinguished. This is a big advantage where the lamps are used for street lighting; and it is preferable to the method of extinguishing every other lamp at midnight, as there are then no black lengths of roadway between the lamps.

I have seen a copy of the certificate of Mr. Jacques Abady, who tested the 600 candle power lamp in April, 1912; and he gives the mean lower hemispherical candle power as 549, which is equal to 33 candles per cubic foot.

Maintenance Costs.

I have not made a note of the maintenance of the lamps which we have fixed; but I can give the figures of the Urban District

Council for public lighting. These lamps are also thoroughly cleaned weekly:

Number of lighting hours to date	980
,, burners	28
,, mantles used	12
,, ,, per burner	·427
,, globes used	0

It will be seen from the above that the average life of a mantle is practically 1000 hours, and considering that three hurricanes have blown since they were erected, I think that the maintenance is very good.

The following costs have been worked out on the October-December quarter of last year.

High-Pressure.

Type.	Nominal Candle Power.	Lighting Consumption.	Engine Consumption.	Total Consumption.	Total Cost.
Keith	7700	38,000	3400	41,400	£5 14 9
Pharos	7100	32,500	6300	38,800	5 5 3

Low-Pressure.

Welsbach "Emperor"	4600	24,400	—	24,400	3 9 2

High-Pressure.

Type.	Cost per Nominal 1000 c.p. s. d.	Cost per Hour in Pence.	Consumption per Nominal 1000 c.p. hour. Cubic Feet.
Keith	14 10·8	·6884	18·9
Pharos	14 9·8	·6846	17·6

Low-Pressure.

Welsbach "Emperor"	15 0·3	·8181	24·1

In fairness to Messrs. Keith and Blackman, I ought to state that the one or two low-pressure burners which are in use on their installation, have burned rather late at night during the above quarter, so to all intents and purposes, both the "Keith" and "Pharos" installations can be regarded as equal for consumption.

It will be seen that the engine of the "Pharos" plant has consumed more gas than the one of the "Keith" plant. When the plant was erected, the original engine was found to have a bad casting, and so was rejected. A ¾ H.P. gas-engine was not available at the time; so the only thing we could do was to make use of the larger-sized engine—much to the pleasure of the consumer, who got a better engine than he bargained for.

The above results speak for themselves; and although the low pressure is a little higher than the H.P. charges, the point to be borne in mind is that the initial outlay was not as much.

Maintenance.

It is of vital importance to every undertaking to see that the maintenance charges to their consumers are as low as possible; and it is a disgrace to any undertaking to see the way some gas-burners are kept. I think that there should be a definite maintenance scheme in every town, and this should be done at as cheap a rate as possible. At Castleford, we charge only for mantles, &c., used, and nothing for the fitter's time.

The profession cannot afford to lose trade through lack of consumers' burners not being looked after; and it is also our duty to see that they are well satisfied. A moderate bill, paid with good grace, is much better than a big one paid by a consumer who grumbles at the size of it.

The paper was illustrated by samples of the various lamps described, loose parts, mantles, globes, &c.

DISCUSSION.

Mr. H. Townsend, jun., said that at Wakefield they had at first adopted lamps with three nozzles, on the principle that, even if a mantle broke, two would remain, and the lamp still be serviceable; but they had found maintenance charges so heavy with lamps of this kind that they had reverted to the single-nozzle type, and had in consequence much lower renewal expenses. All their lamps were low pressure, and they had been obliged to reduce maintenance expenses to an absolute minimum, as so many consumers seemed to expect everything supplied free—even calling for the gratuitous supply of fresh globes to replace those broken by snow sliding off the roof. In some trial high-pressure lamps, they had been greatly troubled with the readiness with which the gauze dust screen got clogged-up, resulting in a speedy drop in the lamp efficiency.

Mr. Clegg asked for more particulars as to how candle power varied according to whether the mantle was ramie or silk, and how it was woven. Which was the best material, and what kind of woven mantle did the writer consider the best?

Mr. Butterfield asked if the high-pressure lamps were hired or sold outright.

Mr. Pykett inquired if the adjustment of the low-pressure lamp was by means of a spring or an eccentric lever. Were enamelled casings to be preferred to copper; and, if so, why? Had the author had any trouble with globes breaking because of small holes developing in the mantles, and could the mantle-holder of the high-pressure lamp be unscrewed without damaging the mantle fastened on it?

Mr. Scholefield asked how the high-pressure gas charges were calculated. Were they based on the burning hours or the gas consumed?

Mr. North said that at Ossett they supplied high-pressure gas, and measured it as such by means of Parkinson's special high-pressure meters. The pressure at the meter was 54 inches, and everything had so far gone satisfactorily with the meters and their work.

Mr. Garsed agreed with the writer that high-pressure gas was apt to be over-rated, and thought that, on the analysis of costs, &c., furnished, it seemed very doubtful if it were worth while a consumer incurring the heavy initial expense if he had practically also to burn about as much high-pressure gas as low-pressure gas to get a given nominal candle power.

Mr. Edwards wanted to know Mr. Dawes' authority for stating that no secondary air was used in the high-pressure lamp described. The globe was open at the bottom, was not fitted air-tight in its supports, and had a good outlet for waste gases, so that obviously a secondary supply of air was passing in. If in any degree it was only using primary air, and drew none in subsequently, it was near the ideal of the closed globe just being introduced by Keiths.

Mr. Sutton wondered why the Castleford gas authorities had not decided to instal a central compressor and retail the gas already compressed. If high-pressure gas ultimately came into more general use, it would involve an unfortunate amount of scrapping of these individual compressors. He should be glad if any one present could give experiences of the systems that compressed mixed gas and air. He thought such installations answered better for comparatively low pressures than for what were now considered high pressures.

Mr. North quoted cases in his district where such lamps were installed and answered well. They were originally put in because of the difficulty experienced in getting adequate gas pressures in a certain low-lying district. He wished to know if Mr. Dawes had had any trouble with the bye-passes on the high-pressure lamps. They had been greatly troubled. The bye-pass flames would vary from 3 inches at one time down to $\frac{1}{16}$ inch at another. Finally, all were taken out, and torch lighting substituted. In some woollen factories where much dust was in the air, a great improvement and great saving had been effected by installing a system of lamps working on 6 inches pressure. When work was stopped, or at any time when the compressor went out of action, or if its belt flew off, the lessened light was still enough to get along with.

Mr. Dawes agreed that maintenance costs might, with some types of lamp, become very heavy, and quoted figures in proof of this. In fact, a heavy bill for broken glasses, globes, and mantles might almost outweigh light economies and improvements. Silk mantles—that was, artificial silk—were stronger than ramie; and he thought single knitting was the preferable form of manufacture. Copper was not as favourable for high-pressure as for low-pressure lamps. Enamelled steel was advisable in the former case. They sold the lamps outright to the consumers. The mantle-holder screwed off easily and safely. The gas was measured at low pressure immediately before the compressor. The meter was ample in size, and no dragging was necessitated. In addition, a gas-bag was placed immediately after the meter-outlet, as they would with a gas-engine; while under the "Pharos" compressor itself was a reservoir. The reason their high-pressure installations were self-contained was that they were partly in the nature of an experiment, and, in any case, were so far from the works that a high-pressure main supplying them would have a blank travel of from half-a-mile to a mile, in order to reach these shops. Mr. Garsed's suggestion that the high-pressure lighting was "hardly worth while" was best met by referring him to the hourly costs given for equal illumination. Regarding the claim that these high-pressure lamps used only primary air, he was referring to the sufficiency of such air for complete combustion being drawn in at the nipple, rather than to the absolute exclusion of any subsequent air by means of a closed globe.

SHADES AND REFLECTORS.

In the diversity of matter that comes within the scope of illuminating engineering, shades and reflectors have an important place—a place that has value in both economy and utility. The knowledge of the subject is not great, and what there is is not widely diffused. In the workshops of lamp makers, reflectors were at one time (and in some cases this is true now) something that had no definite meaning or justification attaching to their design and use. For these and other reasons, interest attaches to the paper that Mr. J. G. Clark and Mr. V. H. Mackinney submitted at the monthly meeting of the Illuminating Engineering Society last Tuesday, at the Royal Society of Arts. On the occasion, Mr. F. W. Goodenough presided. Mr. Clark took upon himself the duty of reading the paper.

The difficulties of the subject were shown in the very first paragraph of the communication, in which the authors stated that the art of shading, in its broadest sense, involves the application of a variety of scientific principles, including reflection, refraction, diffraction, and diffusion; and these in turn can be further subdivided. The subject is also complicated by physiological and

psychological phenomena which lend themselves to various interpretations, according to individual taste. The authors, however, restricted themselves in writing the paper to some of the more practical qualities that shades should possess.

They defined illuminating engineering as the science of the efficient production and utilization of light. There are doubtless, they remarked, great possibilities in the direction of the *production of light*, yet it will surely be agreed that the *efficient utilization of existing light sources* is of more immediate importance. Light, as raw material, is cheap enough even now. The economic possibilities of using this light are, at least, as promising as any impending improvements in the methods of production. The latter is uncertain; whereas the former is certain. It is curious how seldom people seem to analyze what a shade or reflector is intended to do. In many cases the mere presence of a reflector appears to be all that is considered necessary. It is sometimes placed quite a distance away from the source; and the user apparently never realizes that, before a reflector can reflect light, light must fall upon it. It need scarcely be said that neither globe, shade, nor reflector, can *create light*, but is merely an aid in distributing it.

The main functions of a shade might perhaps be defined as follows: (1) The screening of the source of light from the eye, and avoidance of glare. (2) The direction of the light where it is chiefly needed—*e.g.*, reduced illumination of the upper part of the walls and ceiling, and improved illumination on the working plane. (3) The softening and toning-down of shadows. (4) Decorative effect. Of these, the economical advantage of altering the distribution of light from a source so as to suit one's convenience is manifest. The lamps available at the present time admittedly differ enormously in this respect. Note, for example, the contrast in the light immediately below an upright and an inverted mantle, and a difference in the directions of maximum candle-power from a metallic filament, flame arc lamp, or mercury vapour lamp. It is rare indeed that a source gives exactly the distribution of light required for a specific problem; and it is almost always necessary to use with it a suitable reflector. In many cases the maximum light is emitted horizontally, whereas in practice one usually requires the majority of the light to be thrown downwards. With the use of proper shades and reflectors, there would invariably result better illumination at a cheaper running cost; so that any expense incurred by the adoption of suitable reflectors is more than compensated for by the improved illumination.

Shades may be divided into three great classes, firstly, those that are mainly reflecting; secondly, those whose chief purpose is to shade the light and tone-down its brilliancy; and thirdly, those which diffuse and redirect a substantial portion of the light during transmission, and in so doing may direct it in some desired direction. The following table, without being exhaustive, comprises the chief varieties of shades in use:—

SHADES.	MATERIALS.
Opaque reflecting.	Cardboard, enamel, iron green-cased opal.
Transparent reflecting.	Clear glass with external prisms.
Translucent reflecting and diffusing.	White or nearly white glass, including opal.
Transparent refracting and diffusing.	Clear glass with external and internal prisms.
Diffracting (an effect intermediate between transparent and translucent.)	Clear glass, sand-blasted or acid-etched.
Globe form (those possessing the properties of diffusion or diffraction, and re-direction).	Clear glass with external and internal prisms. Opal, white or nearly white glass. Clear glass sand-blasted or acid etched.

The variety of shade most suitable in practice naturally depends to a great extent on which of the four main functions—suppression of glare, redirection of rays, and softening of shadows or decorative effect—is most important. The first two considerations usually occur together. By the very fact of reflecting in a desired direction light which would otherwise pass out horizontally, glare is diminished. In providing general illumination, one usually prefers a translucent shade which allows a certain amount of light to be transmitted out into the room, and so avoids excessive contrasts. For local lighting, on the other hand, when the shade is placed comparatively near to the worker's eye, an opaque shade, completely covering the source, is usually desirable. The question may here be raised whether any minimum intrinsic brilliancy for shades should be prescribed. It will be recalled that the brightness of the sky (about 2 to 3 candle power per square inch) has been suggested; but some have contended that the figure should be even lower. A factor that has a material influence on the apparent brightness of a shade is background. In the photograph, this is illustrated by the various sources of gas light having been photographed first against a black, and secondly against a white cloth. In a photograph of this kind, one naturally cannot reproduce the exact impression of the eye, owing to limitations of contrast; but the illustration gives an idea of what is meant. The bright portions of the shade and its edges are much less prominent when the background is white.

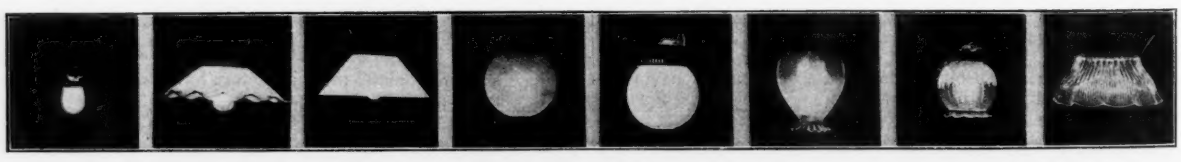
In lighting of a purely utilitarian character, the redirection of light is a most important function. It leads to better illumination, and may also render possible economies. By introducing the right form of reflector sources of lower candle power and smaller consumption may often be substituted, and yet an actual increase in illumination obtained on the working plane.

There are, of course, also cases in which artistic appearance is everything, and the cost of comparatively small moment. It may then be legitimate to permit quite a large amount of light to be absorbed in the material of the shade (silk, alabaster, &c.) for the sake of ornamental effect. But it may be said that the importance of the shade as a decorative object is not yet sufficiently recognized, and offers a vast field for the artist and the architect. At present, one often sees noble and richly decorated interiors lighted by extremely tawdry and cheap shades and fittings. It is a matter for wonder that the care bestowed on the architectural scheme of an interior so often stops short at the illumination.

Owing to the number of illustrations and polar curves used to illustrate the paper, it is not possible to give the larger part of it; and so there must be restriction to general points. A number of the graphic adjuncts to the paper showed the effects of using good and bad reflectors. Among other points, consideration was given to the relative effects of some typical reflecting materials. Four conical reflectors of identical size and contour were prepared for use with an inverted incandescent gas-burner; the major diameter being 11 in., the depth 2¾ in. The materials used were: (1) Plain white opal. (2) Green-cased opal. (3) Enamelled steel. (4) Silver-mirrored glass. The redistributing effects of these reflectors were shown as a series of polar curves; the same source being used in each case. With the silvered glass there was such a high flux of light as compared with the other reflectors, that it had to be shown separately. It is interesting to note that in the case of the plain and green-cased opal and enamelled steel, where there is only a small amount of specular reflection, the redistributing effects are so nearly alike as to be regarded as identical. A quite different effect, however, is produced by the silvered glass. The superior reflecting power of this material acts both quantitatively and directionally. From these results it may be inferred that, with materials having a minimum amount of specular reflecting power, reflectors of the same form will have approximately the same redistributing effect, and that the quantitative effect will be proportional to the co-efficient of reflection of the surface. Among other features, the excellent redistributing effects were shown of Holophane prismatic reflecting-shades, as applied to inverted incandescent gas.

The curves and other illustrations served to show what marked

GAS UNITS.



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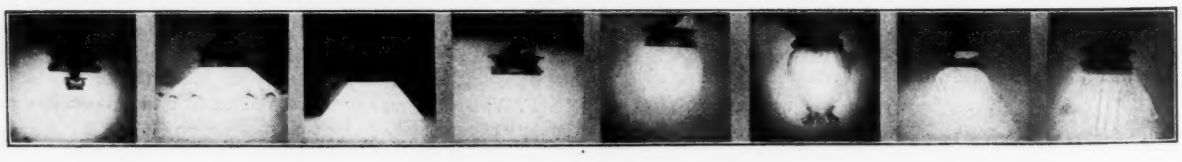


Close against White Background.

ILLUSTRATING THE APPARENT BRIGHTNESS OF SHADE AND MODIFICATION OF "GLARE" EFFECT WITH CHANGE OF BACKGROUND.

differences in the distribution of light may be caused by slight modifications in the form and material of shades and reflectors. It is becoming increasingly common for manufacturers to give the polar curves of light distribution resulting from a given source with a specified shade or reflector; and information of this kind undoubtedly adds very considerably to the value of such a unit. When one has no knowledge of the effect of a given type of shade, it is impossible to form an accurate idea as to what the illumination will be. Yet, if one may judge from the events of the last few years (as exemplified in the series of photometric measurements recently made on behalf of the Home Office by Mr. D. R. Wilson), the tendency in future will be to specify actual illumination on the working plane; and the contractor will have to know how to place his lamps in order to secure that illumination.

The production of shadows is an important point in the art of shading. When a light source is equipped with a reflector, the reflector becomes part of the source, and for practical purposes the two must be considered together as one unit. In the case of diffusing reflectors—as, for instance, Holophane, opal, white glass, enamelled steel, &c., the extension of the area of the light source which accompanies their use, tones down the edges of the shadows so that they become much less visible than when no reflector is employed. As a means of avoiding harsh and abrupt shadows, one may also take advantage of reflection from walls and ceilings. Inconvenient shadows are much more apt to be produced in very darkly decorated rooms than when the surroundings are fairly light in tint. In fact, the most extreme instance of the principle of distributed sources of light is indirect lighting, when the light is thrown upwards on the ceiling. The authors, however, think it is easy to over-rate the supposed comfort produced by total indirect or diffused lighting.

The difficulty with artificial lighting in practice is to reproduce the best direct daylight conditions with the means at disposal. Artificial direct systems should, in order to compare favourably with direct daylight, comply approximately with the following conditions: (1) Give relief from glare for all normal positions of the eyes. (2) Distribute over the lower hemisphere 80 per cent. of the light. (3) Diffuse into the upper hemisphere 20 per cent. of the light. (4) Give fairly uniform illumination over the working planes. (5) Produce single shadows, or one intense shadow surrounded by very soft ones. Intense shadows should always be thrown in a harmless direction. (6) Give a horizontal illumination and surface brightness in excess of the average value for the walls and other upright surroundings. (7) Give as far as possible an equivalent colour-value. These are important points to bear in mind in connection with all kinds of shades, as their influence on the intensity of shadows, &c., can be very great.

A Few Points from the Discussion.

The discussion was of considerable length; but we must confine ourselves to a few of the points. The Chairman (Mr. F. W. Goodenough) disagreed with the authors that illuminating engineering had to deal with the production of light. He did not think the question of light production was within the scope of the Society, or had ever been under discussion. Illuminating engineering had to deal with the efficient utilization of the light. Of the importance of the subject of shades and reflectors, there could not be two opinions, because it was upon the use of good shades and reflectors or of wrong shades and reflectors that good or bad illumination results were obtained. Bearing upon the subject of shades was the protection of eyesight. The preservation of eyesight from damage by the use of artificial illuminants was one of the most important subjects with which the Society could deal. Many of them had now to use spectacles; and judging by statistics regarding the eyesight of children in schools, the proportion of spectacled persons was likely to increase rather than otherwise. The authors had referred to the failure of the public to give the necessary attention to lamp shades and reflectors when they had them. A point that the advisers of the public should accentuate whenever they had the opportunity was the false economy of indifference to the maintenance of their sources of artificial light. Periodical cleaning and maintenance were necessary whatever illuminant was employed. As to lamp makers giving polar curves in future, one would welcome this, and more so if they were all prepared by some independent testing-laboratory. They wanted increased lucidity of information regarding the lamps put upon the market, instead of having vague candle powers offered to them. He agreed that the value of indirect lighting was frequently overestimated. For one thing he did not like the monotonous effect. It would, he suggested, be interesting to have some experiments carried out regarding colour discrimination with direct and indirect lighting.

The next speaker was Mr. J. Darch, who said the shade that was wanted was one which would protect our eyes from the dangerous intensity of light sources, and yet promote the distribution of the light rays. In his view, the intrinsic brilliancy of a shade should not exceed $\frac{1}{10}$ candle per square inch. An ideal condition was that the shade should not be brighter than the background. It was held by Mr. A. Blok that if proper reflectors would give an increase in the illumination where required, there was real economy to be effected there in favour of the consumer. Mr. Frank Bailey (the Chief Engineer of the City of London Electric Supply Company) remarked that it had been said that the low cost of light was rather to blame for the neglect of the proper use of reflectors. He desired to point out to Mr. Goodenough that it was the abominably low cost of gas that was the chief cause. [Laughter.] He also observed that reflectors were not shades, nor were shades reflectors. The latter did not avoid glare, nor did they protect the eye. He commented on the difficulty of keeping clean the form of shades that were largely in use. He was certain that by the use of bowls semi-direct lighting would be more largely used. Larger bowls, however, were required; and English glass makers should give attention to this matter. He was of opinion that if the glass makers and the illuminating engineers could come together, much good would result. Professor Morris gave information as to observations which had led him to the conclusion that neither lamp makers nor the public knew all they ought to do about the design and use of shades and reflectors. Both makers and public required educating. Mr. Wheet called attention to some curves, which showed that an opal reflector with a depolished surface gave the best distribution curve, upon which Mr. Mackinney later remarked to the effect that there had to be regard to the pockets of consumers in respect to these things. It was no use, excepting for special conditions, producing a thing that, through cost of manufacture, was not going to be a commercial success. The electric metallic filament lamps in the hall of the Society of Arts have been recently fitted with reflectors; and Mr. Haydn Harrison held that they produce glare, and it is the glare that many people have complained of at the meetings. He also stated that he found that the glass makers were not encouraged to produce really good things, as people generally were not prepared to pay the price; yet by buying better and suitable glass shades eyesight would be saved. Mr. George Campbell, Mr. Ritchie, and others contributed to the discussion; and afterwards Mr. Mackinney commented on the points that had been raised.

The Dessau Vertical Retort Patents.

The combat of words between the Dessau and the Pintsch Companies with regard to their respective vertical retort systems still continues. In the "Journal für Gasbeleuchtung" for Feb. 22 appears an answer by the Pintsch Company to the somewhat cutting remarks by the Dessau Company, of which a translation appeared in a recent number of the "JOURNAL." This new communication was as follows: "It is of no consequence that the Pintsch-Bolz ovens give a gas less poor in naphthalene than do those of the Dessau Company. In both cases naphthalene is produced (see report of Herr A. Albrecht and Dr. Fritz Müller in the "Journal für Gasbeleuchtung" of June 24, 1911), and it is a matter of indifference whether the retorts are filled to the top, or nearly to the top. We would further draw attention to the reports of larger gas-works, which have installed vertical retorts of the Dessau type, and have discovered afterwards the necessity of adding naphthalene washers for them. The tar from Pintsch retorts is of the same quality as that from Dessau installations. Similarly, it is not in accordance with fact to say that Pintsch-Bolz retorts must remain empty for half a metre at the top; but it was expressly stated in the decision of the High Court (Landgericht) that the said retorts must remain empty for *about* half a metre at the top, if they are to be heated above the temperature commonly employed in the year 1903. Otherwise no regulation exists at all. As a matter of fact Pintsch-Bolz ovens are not heated above the temperature which was customary in 1903. Yet the upper part of the retort is left empty for about half a metre of the heated portion, and the retort is naturally heated above 700° C., since this is necessary for the reasonable distillation of the coal. There can be no question of minute observation of Pintsch retorts in filling and using them, which the Dessau Company said would be necessary, in order to avoid infringing any patent. The retorts are filled from special measuring hoppers to the required degree, and there can be no danger of infringement of regulations by the workmen.

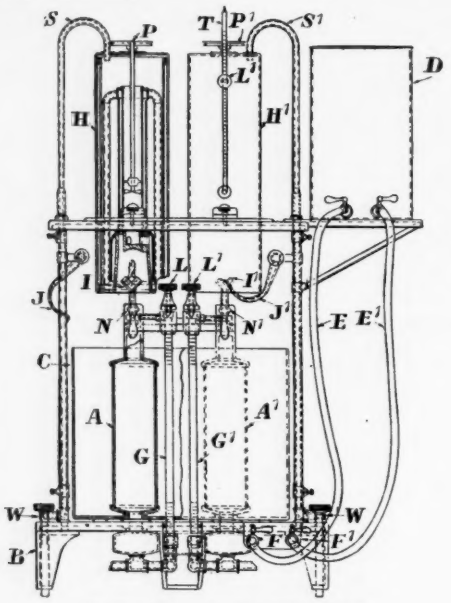
Detection of Carbon Monoxide in the Air.—Two methods for the detection of small quantities of carbon monoxide in the air were described recently before the Paris Académie des Sciences. The first method, the idea of M. Armand Gautier, is based on the reduction of iodic acid by carbon monoxide at temperatures varying between 60° and 80° C. The air is collected in an aspirator, and then passed into a vessel containing iodic acid at 70° C. The iodine is passed into a tube of chloroform, which assumes a pink colouration varying according to the amount of carbon monoxide present in the air, which is estimated by comparison with the colour of tubes containing a known quantity of iodine in the same volume of liquid. By this method it is claimed that one part of carbon monoxide in 200,000 parts of air can be detected. In the second method, described by M. Guasco, it was shown that the rise of temperature indicated by a mercurial thermometer, the bulb of which is covered with platinum black, is only a few tenths of a degree for each 0·1 of one per cent. of carbon monoxide present. In order to obtain thermometric differences easily discernible, use is made of Leslie's differential thermometer, one of the bulbs of the U-tube being coated with platinum black. By means of an outer cover, the bulbs are protected from direct contact with the atmosphere; the air penetrating through a porous partition in the outer covering. Any change in the levels of the liquid in the U-tube is noticeable; and the proportion of carbon monoxide present in the air is indicated by a graduated scale.

AMERICAN INVESTIGATION ON CALORIMETRY.

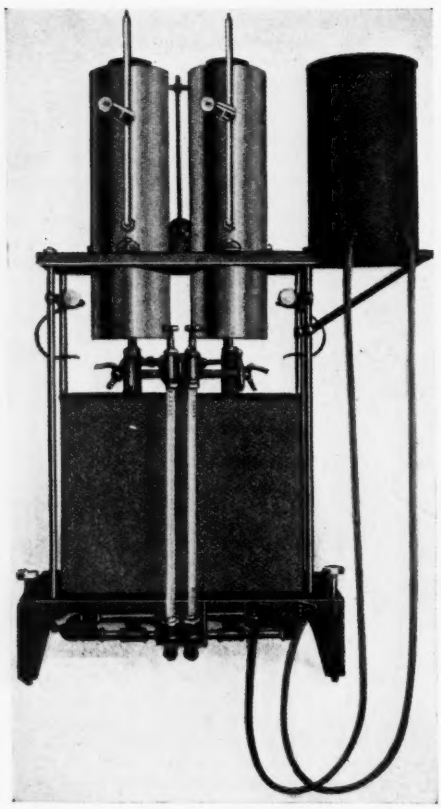
In the last issue of the "Journal," some extracts were given from the report presented by the Committee on Calorimetry of the American Gas Institute at the last annual meeting. The following further extracts will complete our notice of the report.

The Parr Calorimeter.

This instrument, of which we give a front view and a cross section, was examined under the supervision of the Committee. As it differs from the others in almost every respect, they give the following particulars of it, taken to a large extent from a description given by Professor Parr in the "Journal of Industrial Engineering Chemistry."



Section of Parr's Gas Calorimeter.



Parr's Gas Calorimeter.

In the Parr calorimeter, two parallel systems are so arranged that equal volumes of gases may be taken and placed under equivalent conditions of temperature and pressure—being submerged in the same vessel of water C. The pressure is obtained from water in the gravity tank D, which is connected by rubber tubing E E^1 and iron piping to the gasholders A A^1. The heater tanks H H^1, containing equal amounts of water, are arranged with burners, conduits, and stirrers devised to extract the heat. The rise in temperature is indicated on Fahrenheit thermometers T T^1, which pass into the heater through gaskets. It will be seen that the rise in temperature of the two systems will be in proportion to the heat liberated in each. If, therefore, in one of the systems, a standard gas, such as hydrogen, be employed, and its heating value taken as a standard at 60° Fahr. and 30 inches of mercury, the heating value of the hydrogen will be to the heating value of the unknown gas, in the same condition as to temperature and pressure, as the ratio of the indicated rise in temperature of the two thermometers. The details of the apparatus are carried out with reference to this principle. The stirring of the water is effected by a small motor, located just behind the heater tanks, and on a level with the gravity tank. A common belt actuates the two pulleys P P^1, with turbines arranged on the interior of the heaters. The heaters are connected at the rear with automatic overflows, which can be adjusted to measure equal amounts of water. Provision is made for measuring, with accuracy, the volumes of the gases, by reducing the area of the containing vessels above and below, so that the starting and stopping points may be accurately indicated on the glass gauges G G^1 on the front of the instrument. Swinging pilot-lights J J^1 are provided at the left and right for the simultaneous ignition of the burners. The gasholders are cylinders, 7·5 c. by 25·5 c., reducing above and below to a neck of 2·5 c. in diameter and holding approximately 1½ litres. (2·6 pints). They are submerged in the large square tank C, which rests on the base B of the instrument.

From seven to nine minutes are required for burning-out the contents of the gas cylinders. The needle valves N N^1 are finely adjusted so that the water-levels on the glass gauges may be made to stop at any desired graduation. Corresponding graduations on the two gauges represent exact equivalents of gases. Before beginning a test, the water-levels in the gauges are brought to corresponding marks by means of the needle valves L L^1. It is not necessary to know the exact volumes in some definite unit, as it is only essential to have equivalent quantities. Since these are subjected to the same temperature and pressure, the operation is independent of barometric conditions and room temperature. The operation is also independent of the relative humidity of the atmosphere, provided the same amount of water is generated by the combustion of each gas. The only condition, therefore, not covered by the preceding provisions is the matter of radiation. For this element in the case, advantage is taken of the fact that the heating value of hydrogen—325 B.Th.U. per cubic foot at 60° Fahr. and 30 inches of mercury—is about half that of ordinary town gas. Hence, by installing a double cylinder—or rather a third cylinder, not shown in the diagram—of exactly the same volume as the other two gas containers, and cross-connecting the same in such a way as to make it possible to burn two volumes on one side against one volume on the other, almost exactly equivalent quantities of heat are discharged under each heater. Thus the radiation will be practically the same in both systems.

It will be evident also that for some types of gas, having approximately 300 to 350 B.Th.U. per cubic foot with hydrogen as the standard of comparison, equal volumes of each would be taken; while for lower grades of material of (say) 100 to 150 heat units, the reverse of the first condition would be called for, and two volumes of the unknown gas would be burned against one volume of hydrogen.

The hydrogen used with the Parr calorimeter is generated from an alloy of sodium and lead sold under the name of "Hydrone." The gas is generated in a simple generator operating on the Kipp principle. When the "Hydrone" is brought into contact with water, a copious evolution of hydrogen occurs, and the quality of the gas is high.

Operation of the Calorimeter.

See that the gravity tank is nearly full of water, which should be saturated with gas of the same kind as is to be tested. Admit water to the gasholder, and release the air in the cylinders through the inlet cocks on either side. These cocks are set at an angle slightly to the rear and downwardly, on either side, connecting directly with each of the front cylinders. Fill completely with water until it flows from the inlet-cocks. By a rubber hose the right-hand cock is connected with the gas supply and the left-hand cock with the hydrogen generator.

The cylinders are filled with gas by lowering the gravity tank and opening the inlet cocks. The gas is allowed to flow in until the level, as shown on the glass gauges, disappears at the bottom. A little more gas is then allowed to run in; then the inlet cocks are closed; and the gravity tank elevated to its place. A sufficient surplus of gas is thus admitted, so the level will not yet appear on the gauges. The water-levels are then brought into the glasses,

and adjusted to the same level by opening the vents at the top of the gauges. The heaters are filled with tap water to the point of overflow, and allowed to drain by means of the automatic syphon discharges. The motor is now started; the belt being so placed as to turn the pulleys to the right or as the hands of a watch, thus causing the central column of water to rise.

When equalization of temperature has been obtained, the reading of each thermometer is taken, and the gas at the burners is lighted. This is accomplished by having a small flame adjusted at the tip of each of the swinging pilot-lights, turning each to place, and at once turning open the needle valves to the burners. The relative rates of flow should be kept approximately the same, and the rate of combustion so gauged that the complete discharge of the gas is accomplished in from seven to nine minutes. At the close of the test, one is allowed to complete the discharge a little ahead of the other. The needle valve is closed when the water-level reaches any desired mark, the other system slowed-down as it approaches the end, and finally shut off at the same gauge mark as the first system.

After permitting an equalization of temperatures, the thermometers are read as at first. If ordinary town gas of 600 to 700 B.Th.U is being tested, the rise in temperature on the right-hand side will be from 4° to 6°. The rise in temperature for one tank of hydrogen will be from 2° to 2·75°. Hence two measures of hydrogen should be taken. This is accomplished by having the cross-connecting cocks open above and beneath the base.

It is well to have the temperatures in the two heaters somewhat near together at the start, and 3° to 4° lower than that of the room. In this way the equalization of the temperature in each heater after turning off the gas is not materially affected by the external radiation.

Radiation Tests.

In order to determine the rapidity with which heat is radiated from, or absorbed by, the heaters, several radiation tests were made. In the first test, the heaters were filled with water at about 4° below the temperature of the room, the motors were started, equalization of the temperatures in the heaters was allowed to take place, and then the temperatures registered by both thermometers were read. The stirrers were allowed to run continuously, and at the end of half-an-hour the temperatures were again read. The following were the results:

Room temperature	Beginning . 77° Fahr.		
	End . . . 76° ,,	Aver.	76·5° Fahr.

	Left-Hand Heater.		Right-Hand Heater.
Initial temperature	72·60° Fahr.	..	72·58° Fahr.
Final ,, ...	72·87° ,,	..	72·89° ,,
Rise	0·27° Fahr.	..	0·31° Fahr.

In the second test, the heaters were filled with water at about 4° above the room temperature, the motors were started, and after equalization of temperatures had occurred the thermometers were read. After a period of 40 minutes had elapsed, the temperatures were again read, with the following results:

Room temperature	Beginning . 77° Fahr.		
	End . . . 76° ,,	Aver.	76·5° Fahr.

	Left-Hand Heater.		Right-Hand Heater.
Initial temperature	79·51° Fahr.	..	79·53° Fahr.
Final ,, ...	78·86° ,,	..	78·90° ,,
Fall	0·65° Fahr.	..	0·63° Fahr.

It will thus be seen that the interchange of heat between the atmosphere of the room and the water in the heaters is fairly rapid. Therefore, when operating this calorimeter it is very essential that it should be carefully guarded from draughts, and that very nearly the same amounts of heat should be absorbed during the same interval of time in each heater.

Comparative Tests with the Original Junkers, the Parr, and the Doherty Calorimeters.

A large number of preliminary tests were made with the Parr calorimeter before it was checked against the original Junkers. This was thought to be necessary in order to acquire skill in working with the instrument, the operation of which is so radically different from that of other types. Several points of manipulation were noted. Three series of determinations were made with the two instruments, and alternate tests on each. The relative humidity of the air supplied to the Junkers calorimeter in this series was above 90 per cent.; while for the Parr it was about 25 per cent. The results (B.Th.U. per cubic foot) were as follows:

First Series.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	Aver.
Junkers . .	608·6	602·0	599·9	601·4	—	—	603·0 601·1*
Parr . . .	599·2	598·3	601·5	604·2	—	—	600·8

* Average of Nos. 2, 3, and 4.

Second Series.

Junkers . .	596·0	594·9	594·6	594·8	593·4	592·6	594·4
Parr . . .	597·4	598·8	597·1	594·2	590·3	591·2	594·8

Third Series.

Junkers . .	607·2	606·6	604·2	601·3	603·0	—	604·5
Parr . . .	612·7	607·2	597·4	597·3	597·7	—	602·5

These results show very conclusively that, under the proper working conditions for each instrument, the efficiency of both calorimeters is the same. To obtain this efficiency with the Junkers calorimeter, the air supplied must be practically saturated with moisture. If the moisture produced by the combustion of both gases burnt is nearly the same, conditions of relative humidity of the atmosphere do not affect the results of the Parr calorimeter.

In the comparative tests with the Doherty and Parr calorimeters, each instrument was operated on air of the same humidity, and according to the standard directions. The following are the summarized data:

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	Aver.
Doherty . .	609·1	610·4	611·7	608 4	610·3	610·3
Parr . . .	608·8	610·7	609·7	611·8	609·7	610·1

These results show that the two calorimeters give identical results when operated under proper conditions.

SUMMARY OF THE INVESTIGATIONS OF THE PARR CALORIMETER.

The results of the investigation of the Parr calorimeter may be summarized as follows:

1.—The use of a gas-meter is obviated.

2.—The heated water is neither weighed nor measured in making a determination.

3.—The calorimeter is of the "still water" type.

4.—The efficiency of the instrument is the same as that of the original Junkers, the Doherty, and the American Meter Company.

5.—The operation of the calorimeter necessitates the preparation of hydrogen as a standard gas; and the quality of the hydrogen is satisfactory. There is a little uncertainty as to the heating value of pure hydrogen; but Thomsen's value is the most dependable, and there seems to be no good reason for bringing this value seriously into question.

6.—The mechanical construction of the hydrogen generator might be somewhat improved.

7.—The use of two generators would avoid annoying delays.

8.—Two methods are available for calibrating the instrument; and both are satisfactory.

9.—If the same amount of moisture is formed from the combustion of both gases burnt in the calorimeter, the relative humidity of the atmosphere does not exert any appreciable effect.

10.—Appreciable transfer of heat occurs between the water in the heaters and the surrounding atmosphere. In order to avoid radiation errors, it is necessary to have the same amount of heat generated in each system during corresponding intervals of time. The instrument should not be exposed to draughts.

11.—The time required for a complete test is twenty minutes.

12.—The heat generated by the stirring devices is small, and is practically the same in both heaters; hence it does not introduce any error.

13.—At the close of a test, it is desirable to stop the water-levels at the first upper graduation of the gauge glasses.

14.—No error is caused by the specific heat of the water being other than unity, for the same water is used for the standard gas as for the gas which is tested.

15.—The instrument is heavy, and not easily portable.

16.—The graduation marks on the thermometers are so coarse as to make accurate readings impossible if the head of the mercury column happens to be directly behind a graduation mark.

17.—Considering a gas of 600 B.Th.U. per cubic foot, an error of 0·02° Fahr. in reading one of the thermometers will cause an error in the heating value of 5 B.Th.U. As the rise in temperature is only a little over 4° Fahr., the percentage of error caused by any error in reading the thermometers is greater than is the case with the other instruments investigated. Also the rise in temperature is determined by readings taken at the beginning and end of a test, not from the average of a number of readings taken during the progress of a test, as is the case with the other instruments. This fact makes the observed rise in temperature somewhat more difficult to determine with accuracy.

19.—Errors caused by variations in temperature of the inlet water in the case of calorimeters of the flow type are obviated in this instrument. The Parr calorimeter can be satisfactorily operated without the use of an overhead tank for the water supply.

20.—The calorimeter is more complicated in its construction than the other instruments investigated; and it appears to require more skill for its proper operation than the other types.

21.—The calorimeter gives gross heating values only.

THE "SARCO" OR BEASLEY RECORDING CALORIMETER.

This instrument is of the recording type, and is entirely different in every particular from the others used in the investigation. It registers net heating values only, and is known to many of our readers. It has been referred to on various occasions in the "JOURNAL," and was described and illustrated in the number for Sept. 21, 1909 (p. 758). It is shown on a small scale in the makers' advertisement which appears from time to time in our pages. It was found by the investigators that when this calorimeter was operated with gas not saturated with moisture, the water-line in the meter would change appreciably in the course of three or four days. This was due, they say, to the fact that the unsaturated gas picked up some moisture while passing through the meter. It was found that an error of from 5 to 7 B.Th.U. might be introduced from this cause after the calorimeter had been operated for six or seven days, using a gas averaging 550 B.Th.U. net per cubic foot. It is pointed out that these observations were made during cold weather, when the gas as drawn directly from the city mains would have the lowest percentage saturation after entering the

building that it would have during any period of the year. This difficulty is largely removed, however, by leading the gas through a saturation bottle just before it enters the meter. In all later tests, the gas was supplied to the meter in a saturated condition. The meter did not undergo any appreciable change during one week of continuous operation. However, it was deemed advisable to check the water-line of the meter and the zero reading of the pointer once in from seven to ten days, and thus guard against any possible errors resulting from these factors. It was found that the zero reading of the instrument would sometimes change after a period of continued operation, so that the instrument would give results ranging from 3 to 5 B.Th.U. high; but if attention is given occasionally to this factor, no serious error will result.

By means of the glass gauge at the side of the meter, it was found that the registrations could be controlled satisfactorily; but when set according to directions, the gas was supplied at the rate of 2·08 cubic feet per hour rather than 2 cubic feet. Therefore slightly more heat was generated in the chimney than was intended; and the Committee say it would be expected that the screw at the top of the chimney ought to be set so as to make the opening for the escape of the products of combustion a little larger than that indicated by the makers. Thus the increased amount of heat generated would be compensated by the increased escape of heat from the chimney. They think it is well to bear this point in mind during the discussion which follows, as conditions were found to be as previously predicted.

The work on this calorimeter covered a period extending from March 1, 1912, to April 26, 1912, during which it was operated under varying conditions, and several series of check determinations were made. The instrument was checked against the original Junkers, which was operated upon air having an average relative humidity of 94 per cent.; and the condensation water was collected and measured with all the necessary precautions.

Before making any check determinations, the screw at the top of the hot limb, or chimney, of the calorimeter is so adjusted that the readings agreed with the net heating values of the Junkers instrument. The position in which the screw was finally allowed to remain differed from that indicated by the manufacturers by the width of two threads; the difference in position being such that the opening was slightly larger than would have been the case if the screw had been in the indicated position. The reason for this slight difference in the adjustment of the screw has already been mentioned.

After making this adjustment, the calorimeter was checked against the Junkers in the following manner: Each series of tests was begun at about nine o'clock in the morning, and extended until about three o'clock in the afternoon. The gas was drawn directly from the city mains, and its net heating value determined each hour in the Junkers. Both instruments were allowed to operate continuously throughout the series of tests. The results recorded for the "Sarco" calorimeter were read off from the fixed scale at the time of making the corresponding determination with the Junkers. The graduations on the charts furnished with the instrument did not coincide exactly with those of the fixed scale; hence all readings were taken from the scale.

In checking the "Sarco" calorimeter against such an instrument as the Junkers, the averages of a considerable number of determinations should be compared, for the gas is burnt nearly four times as fast in the Junkers as in the "Sarco," and the former will note changes in calorific value of the gas more quickly than will the latter. Hence corresponding readings may vary somewhat; but the average of several determinations should give a reliable basis for comparison.

For the first four weeks, the "Sarco" calorimeter was operated each day, and was shut down during the night. In the course of the last two weeks, it was operated continuously. The Committee give a summary of the comparative tests in B.Th.U. per cubic foot; the following being the averages:

Series.	Date. 1912.	Period.	Average of Tests. Junkers.	"Sarco."
1	March 8	12.21 p.m.–3.05 p.m.	554	555
2	,, 9	9.06 a.m.–4.00 p.m.	547	549
3	,, 16	10.53 a.m.–2.55 p.m.	525	523
4	,, 29	9.08 a.m.–3.04 p.m.	534	532
5	April 26	8.50 a.m.–2.09 p.m.	563	564

The determinations tabulated show that the agreement between the average values registered by the two calorimeters is satisfactory. The Committee say it is impossible to read the values indicated by the "Sarco" instrument closer than two 2 B.Th.U. Taking the Junkers as the standard, the deviations of the average values (B.Th.U.) of the "Sarco" in the five series of tests is as follows: Series 1, + 1; series 2, + 2; series 3, − 2; series 4, − 2; series 5, + 1. The average difference for the five series of tests is seen to be zero.

General Summary of the Investigations of the "Sarco" Calorimeter.

The results of the investigations of the "Sarco" calorimeter may be summarized as follows:

1.—The mechanical construction of the instrument is good.

2.—The instrument is sensitive, and will indicate changes in calorific value quickly.

3.—The instrument registers net heating values only.

4.—The calorimeter makes a continuous and permanent record of the heating value of the gas.

5.—In order to minimize meter errors, the gas should be saturated with moisture before it enters the instrument.

6.—The calorimeter should be shut-down once in every seven to ten days, and the water-line of the meter and the zero reading of the pointer checked.

7.—Inasmuch as no direct measurement of the heating value of the gas is made with this instrument, its values should be checked occasionally by comparison with values obtained by the use of a calorimeter making direct determination.

8.—When the above precautions are observed, the instrument gives satisfactory results.

9.—The charts furnished with the instrument did not exactly fit the graduations of the fixed scale; and more exact charts should be made.

10.—The oil used in the calorimeter is slowly volatilized. Small additions of oil should be made as needed.

11.—The instrument may be easily made to agree with any desired standard.

12.—The instrument is necessarily rather heavy, and is not easily portable.

13.—It is impossible to read the heating value of the gas as indicated on the scale or charts more closely than to within 2 B.Th.U.

14.—The directions for setting-up and operating the calorimeter are very meagre. The setting-up of a new instrument would be much easier if more explicit directions were given. It would seem desirable to furnish a sketch showing the essential parts of the instrument, and to refer to these parts by letter or number in the printed directions.

The Committee next give particulars of some tests of the meters used in the investigations, in order to determine to what extent the registrations were affected by changes in temperature; and they close their report with the observations reproduced in the first notice of their work—see *ante*, p. 399.

Abingdon Gas Company.—Including an interim dividend paid in September last, the distribution of the Abingdon Gas Company for the year is 12½ per cent. on the original and "A" shares, and 9½ per cent. on the "B" shares. In selling 33 million cubic feet of gas in the year, the Company show an increase of about 1¼ million cubic feet.

Truro Gas Company and Electric Lighting.—Last Wednesday, the Truro Rural District Council decided not to accede to an application made by Truro Gas Company, in a letter by Mr. S. J. Ingram, the Engineer and Manager, for their consent to the granting of the Provisional Order which the Company are seeking to enable them to supply electric light.

Merthyr Tydfil Gas Company.—Presiding at the annual meeting of the Merthyr Tydfil Gas Company, the Chairman (Mr. H. P. Linton) remarked that, though the price of gas was reduced as from the end of June last by 1d. per 1000 cubic feet (the charge to ordinary consumers being now 2s. 8d.), the total revenue for the year to Dec. 31 amounted to £22,959, against £23,198 for the previous twelve months; and the net profit was £5527, compared with £5686. The reduction in the price of gas, besides giving an increase in the dividends, added 1 per cent. to the bonus of the employees, which was now 4 per cent. on wages and salaries. The full statutory dividends were declared—at the rates of 5 per cent. per annum on the preference stock, and 5⅝ per cent. per annum on the ordinary stock, both less income-tax.

Bath Gas Company.—The accounts of this Company for the year ended Dec. 31 last which were presented at the recent annual meeting showed a balance of £21,890 on the revenue account, and a sum of £29,778 available for distribution. The Directors reported an increased demand for gas during the year; the sales being 5·7 per cent. above those for 1911. The price of residuals being well maintained, the returns under this head were very satisfactory. The coal miners' strike in the early part of the year seriously affected the coal supply; but the Directors were enabled to provide sufficient for the emergency, and an undiminished supply of gas was furnished during the period. Though the price of coal at the time was abnormally high, the price of coke was not increased, and the production was reserved for local consumers. An application having been made by the Bath Corporation to the Local Government Board for a loan to extend their electric light undertaking, the Company appeared in opposition at the inquiry, and, as the largest ratepayers in the city, protested against the payment of rates to support the concern.

Slough District Council and the Gas Company.—In connection with the Slough Gas Company's Bill, the Urban District Council have agreed to the recommendation contained in the following report of their Parliamentary Committee: "A conference (without prejudice to either party) has taken place between the Committee and representatives of the Company, and as the proposed purchase clause more or less governed the other points, this was first discussed; your Committee being informed that if the Council put forward a proposal to buy within a short period and on terms not less advantageous to the Company than those of the Slough Water Company's Purchase Act, the Company will give an undertaking to consider it after consultation with the Directors—it being understood that in such case all other amendments not agreed to by the Company will be withdrawn. The period of two years was mentioned as the time limit. Other amendments were discussed; but, with the exception of one or two of less importance, none were considered acceptable to the Company. Your Committee have concluded that nothing effective can be arranged before the expiration of the time for petitioning against the Bill; and they have therefore instructed your Clerk to prepare a petition in opposition, to be sealed by the Council and lodged forthwith."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

"Our Friend the Enemy."

SIR,—The tone of your editorial comments in your issue of the 18th inst. on my article in your previous number is so lacking in courtesy that I should have left your remarks unnoticed had you not challenged me to reply, and my silence might be misconstrued.

In point of fact, I find little calling for reply. Flat contradiction of my statements does not disprove them; and I find little or no argument.

Stirring up the air in a room is not ventilation; and if the motion of the air is obtained by burning its oxygen, and substituting a poisonous gas for it, only harm can result. Whether the products of the combustion of coal gas are poisonous or not is not a question of belief, but of fact. Your note on the geyser fatality supplies a grim enough answer to your challenge to me to discuss the matter; and I need not add to it.

Most modern illuminants, gas mantles among their number, are best not viewed directly; but I have yet to learn that ultra-violet rays will pass through ordinary glass.

One candle may quite possibly be obtained for an hour from 0·05 cubic foot of gas under test conditions; but the figure 0·083 cubic foot was given me by a gas manager, whose company maintain their consumers' mantles, as the result of his experience under practical conditions, and such conditions are the only ones that matter to the consumer.

As to cost, I merely took 3s. 6d. for gas, and 3d. for electrical energy as convenient figures to illustrate the result of the equivalent values for light production that I had arrived at. The argument is not altered if you take gas at 1s. 9d. and electrical energy at 1½d.

Your remarks about watt-hours per candle are meaningless. There is no fixed equivalence between candles and Board of Trade units; it all depends on how long you burn your lamps. You could get 3 million candles for 1 Board of Trade unit for a second.

In conclusion, referring to your last paragraph, I should welcome criticism of my article; but further comments in the strain of the editorial under reply would be of small value. They leave my article where it was; none of my statements having been disproved.

C. H. WORDINGHAM.

Redhill, Feb. 21, 1913.

[We are very sorry that Mr. Wordingham cannot stand a little criticism without finding it discourteous, or that he should take refuge behind that somewhat common excuse for declining to discuss the matters upon which criticism was passed. His letter supports much of our criticism; but we hope that the pointing out of the obvious fact that it does so will not be laid against us as a further act of discourtesy. Mr. Wordingham evidently looks on the terms "poisonous" and "suffocation" as synonymous. Mr. Wordingham's own lungs contain somewhat about 5 per cent. of carbon dioxide, which he evidently, following the common belief, regards as a "poison." Carbon dioxide in itself, we should have expected Mr. Wordingham to know, is a perfectly innocuous gas. But no human being can live in an atmosphere of carbon dioxide any more than combustion can be sustained in it. An atmosphere of oxygen would be equally fatal. The 0·05 cubic foot of gas per candle is not a result of test conditions. It is an efficiency that we can obtain at any time from inverted lamps that we have in daily use. It is the old electrical fallacy that the figures published by gas men are something that cannot be obtained under practical conditions, and must be the product of careful and elaborate precautions in testing in the laboratory. We are glad that the efficiency figure for gas quoted by Mr. Wordingham is one that was given to him by a gas manager unnamed, and not the result of tests of his own making. Our correspondent's remarks on watt-hours and candles are interesting, coming from him; but they do not advance the practical side of the question. It is also noticed that he has "yet to learn that ultra-violet rays will pass through ordinary glass." Mr. Treacher Collins, F.R.C.S., L.R.C.P., in his House of Commons report, says: Ultra-violet rays "are *to a great extent cut off* by the passage of light through glass, and are *completely cut off* by glass of an *amber tint*." Dr. W. Ettles advises coloured glass bulbs for metallic filament lamps used in factories and workrooms. Mr. Wordingham has, he confesses, "yet to learn" of these things. We rather fancied there was something more than flat contradiction in our article of last week; and, despite what Mr. Wordingham says, we do not think our comments were altogether in vain. He may, of course, be of opinion that the criticism has left his article where it was; and that none of his statements have been disproved. How much proof that his statements are true has he himself yet advanced?—ED. J.G.L.]

Suggested Central Hall for Gas Association Meetings.

SIR,—In a paper I had the honour of reading before the Manchester District Institution of Gas Engineers some fifteen years since (Nov. 27, 1897), I made a digression from the subject under consideration to suggest as follows:—

> "If I may be allowed to digress from the immediate subject of the paper, I would say that what is needed for gas interests generally, in face of the competition to which they are subjected, is a National Institution in London, having a hall suitable for Association meetings (without having to beg for one), together with a reference library, reading-room, secretarial and other offices, laboratory, and correspondence room. It might also be available as the offices of all the London Gas Institutions and kindred societies, and could contain a show-room of stoves, burners, &c. Such a central station might be built and maintained by annual contributions from gas undertakings. It would form a *rendezvous* and centre for gas engineers from every part of the world, when visiting London, and would prove, I am confident, a considerable acquisition of strength to the gas profession."

The subject is becoming one of increasing importance; and it is manifest that if anything can be accomplished in this direction it should be attempted this year. Surely a fund might be started at least which, in course of time—sooner or later, according to the generosities and opportunities afforded—would accumulate sufficient to erect a suitable building such as is desired. The British Commercial Gas Association appears most suitable to undertake such a transaction, having upon its Council men of the highest professional and commercial ability.

EDWARD A. HARMAN,
Engineer and Manager.

Gas-Works, Huddersfield, Feb. 21, 1913.

The Abandoned Coal Export Tax.

SIR,—In your "JOURNAL," the reports from the gas-making industry are always interesting reading to the producers of coal in the North; and while we recognize the jealous guardianship you display of the interests of gas companies, we also feel that the verbal chastisement you at times administer to the colliery companies is meant in all kindliness and for their good.

The Chairman of the South Metropolitan Gas Company (Mr. Charles Carpenter), in his address last week, says he has never been able to understand why the coal export tax was repealed by the present Government. The reason is not far to seek. When Sir Michael Hicks Beach, as Chancellor of the Exchequer, imposed the tax in 1901, he said the foreigner would pay it. But the foreigner did not pay it; and the British collieries had to reduce their prices in order not to be ousted by German and other foreign competition. The London Gas Companies benefited by the low prices which ensued. But Mr. Asquith, when Chancellor of the Exchequer in 1906, recognized that it was an unfair thing that taxation should be used as a lever to benefit one British industry at the expense of another British industry; and, basing his action on the unanimous finding of a Royal Commission which had sat for some years to investigate the whole question, he repealed the tax.

The reason why Mr. Carpenter would welcome the re-imposition of the coal export duty is the reason why the collieries object to it, and the reason why the Royal Commission recommended its removal, and the reason why Mr. Asquith abolished it.

What we in the North cannot understand is why the coal-owner, the coal-miner, and all the multifarious interests allied to coal-mining, should be subjected to undue pressure in order that the London Gas Companies may reduce the price of gas to their customers.

COAL FITTER.

Feb. 19, 1913.

APPLICATIONS FOR LETTERS PATENT.

3394.—SOUTH METROPOLITAN GAS COMPANY and CHANDLER, D., "Gas-burners." Feb. 10.
3404.—BASNETT, F. A., "Globe-holder." Feb. 10.
3476.—LIVENS, F. H., "Suction producers." Feb. 11.
3503.—CASEBOURNE, A. C., "Chimney for gas." Feb. 11.
3538.—YATES, H. J., and DAVY, J. F., "Gas-fires." Feb. 11.
3540.—ANDERSON, D., "Gas-burners." Feb. 11.
3607.—FROST, E., "Gas-fires." Feb. 12.
3643.—NESBIT, D. M., and ASHWELL AND NESBIT, LIMITED, "Radiators." Feb. 12.
3671.—YOUNG, B., "Boxes for mantles." Feb. 12.
3672.—TIMM, F. C. W., "Gasification of fuels." Feb. 12.
3729.—CRACKNELL, T., and NORRIS, B., "Gas-engines." Feb. 13.
3745.—BANKS, E. W., "Controlling gas-stoves." Feb. 13.
3875.—PUTMAN, W. E., and RAWDEN, J. W., "Cleaning mains." Feb. 14.
3876.—FORDER, J., "Purifying gases." Feb. 14.
3912.—KEITH, J. & G., "Controlling the mixture to burners." Feb. 15.
3930.—CALTHROP, E. R., and CHURCHILL, R., "Joints for pipes." Feb. 15.
3931.—SAUNDERS, D. G., JUN., "Shade-holders." Feb. 15.
3953.—SEMPELL, A., and HAFERKAMP, A. "Four-way valve." Feb. 15.

Felixstowe Gas Company.—At the annual meeting of this Company on the 15th inst., the accounts presented showed a profit of £2406, from which provision had been made for interest on debentures, dividends on preference stock, and income-tax. An interim dividend at the rate of 8 per cent. on the "A" ordinary stock and £5 12s. on the "B" ordinary stock had been paid, and a further payment was recommended at the rate of 10 per cent. and 7 per cent.; making a total distribution for the year of £9 per cent. and £6 6s. per cent. respectively, both less income-tax, and leaving a balance of £1100 to the credit of the profit and loss account. In the Directors' report, reference was made to the fact that a new contract for street lighting had been entered into with the Felixstowe and Walton Urban District Council for a period of seven years. The Chairman (Mr. S. Alexander), in moving the adoption of the report, stated that though the last summer was not a good one for the sale of gas in Felixstowe, yet the result of the whole year's working showed an increase of £230 in the gas sales. The amount obtained from the sale of coke was higher by nearly £300, while the other residuals had also increased. This helped to compensate for the advance in the price of coal. The report was adopted.

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

The Half-Yearly Meeting of the proprietors was held on Thursday last, at the Cannon Street Hotel, E.C.—Mr. W. G. Bradshaw in the chair.

The Secretary (Mr. F. J. Bradfield) read the notice convening the meeting; and the Directors' report and accounts were taken as read—see *ante*, p. 381.

A Flood-Tide of World-Wide Prosperity.

The Chairman, in moving "That the report and accounts be received, adopted, and entered on the minutes," said: The year 1912, in spite of labour troubles at home and wars and disturbances abroad, ended in a remarkable flood-tide of world-wide prosperity, in which this country participated to the full. Our foreign trade last year increased by 107 millions sterling over 1911, that of Germany by about 70 millions, that of France by 18 millions, that of Austro-Hungary by 20 millions, while the foreign trade of America was more by 115 millions. This large growth of international trade involved the creation of increased credits, and there resulted a general scramble to get and retain the gold necessary for its protection. Hence the high rates for money which ruled at the end of the year in London and nearly every other Money Market throughout the world, and continue even now. It is most unusual to find a 5 per cent. rate in London at the end of February; and there does not seem to be any immediate prospect of its reduction. Our home industries have also evinced an altogether abnormal activity. In almost every trade factories are working at high pressure. Unemployment has fallen to a minimum, and in some industries there is even a scarcity of workpeople. A good result of the high rates for money and the difficulty of obtaining credit, has been that commercial enterprise has been kept within bounds, and speculation has been discouraged. You will find another result of the high price of money shown in our accounts; for, in consequence of the dearness of money, which always means a fall in Stock Exchange values, the price of gilt-edged securities, in which our reserve and insurance funds are invested, has again been driven down. We have written them down to market value, which has cost in the case of those representing the reserve fund £1108, and in the case of those representing the insurance fund £2130. Of course, all this depreciation of securities has not taken place in one half year. It has been going on ever since we last wrote them down in 1909; and we have not touched bottom yet, for they have depreciated still further since Dec. 31 last. Our funds are invested partly in Consols and partly in other gilt-edged securities authorized for trustees, which follow more or less closely the fluctuations of Consols. Now, people often make the mistake of supposing that it is only British Government securities which stand at a lower price than they used to. Liberals say it is the fault of the Conservatives, and Conservatives attribute the blame to the Liberals; whereas the truth is, at any rate so far as last year is concerned, that the National securities of other countries have fallen to an even greater degree. For example, Consols fell last year 1⅛ per cent., French Rentes 6 per cent., German Threes 5 per cent., and Austrian Fours 6⅛ per cent. Now, as always, the British Government can borrow more cheaply than any other nation.

A Record Balance of Profit and Surplus.

We present to you to-day accounts which show that the Company has made during the half year to which they relate a larger balance of profit than it has made at any time in its history; and the surplus remaining over after payment of interest and dividend is also the largest we have ever had. But, having said this, I am compelled immediately to point out that this satisfactory state of things is largely due to the fact that our annual contracts for the purchase of coal were made at a later period in the year than usual, and therefore the half year under review has had to bear an increase of less than half the enhanced price at which our coals were bought, while we had the full benefit of the increased price obtainable for our residual products. The current half year will feel the full burden of the heavier cost of coal and oil; and we must not anticipate that we shall meet you in August next with anything like such good results.

Advantages of Carburetted Water Gas.

At the same time, I must say that the working results reflect the greatest credit on the Engineer and the Station Managers. We owe it to the installations of carburetted water gas at our three works that the coal stocks were not more seriously depleted during the coal strike, and that we were saved from having to supplement our coal supplies at exorbitant prices; and a part at least of the reason why we find ourselves in such a strong position to-day is that we were enabled to husband our resources by a judicious use of these water-gas plants. The manufacture of water gas also tends to restrict the output of coke and to improve the price of that made for sale; and it has another very important feature about it in that its use lessens the demand for coal, and makes the gas industry less dependent upon the colliery proprietor for the supply of raw material. At the same time, it is very necessary to keep a watchful, and even jealous, eye upon the relative cost of the enriched water gas and the coal gas; for while water gas is a good servant, I am convinced that it may become a very bad master. We have also derived very great benefit this half year from possessing our own steamers. Freights have been soaring to ruinous figures; but our ships have cost us no more than last year, and our coals have been carried at their usual cheap rate.

Large Increase in Gas Sales.

A feature of the half year was the large increase in gas sales, amounting to 63½ million cubic feet, or 3·84 per cent. As you are aware, our increases in the past have been mainly due to the rapid extension of the prepayment meter system; and some half years we have had to record a decrease in the sale of gas by ordinary meters. But last half year the increase in consumption by ordinary meter was the highest we have had for nine years. At the same time, the average consumption per prepayment meter has increased from 13,810 cubic feet for the year 1911 to 14,459 cubic feet in 1912, or nearly 5 per cent. The little increase is the more satisfactory that it is a growth upon existing business. Doubtless the coal strike, and the high prices for coal and the difficulty in obtaining it which followed, did much to educate the public to appreciate the cheapness and convenience of gas for cooking, heating, and power purposes. Every year as it passes seems to emphasize and accentuate its usefulness for these purposes; and there appears to be no doubt that gas will more and more become the fuel of the future in the houses of rich and poor alike. In the half year, we fixed 76 more ordinary meters, 2090 additional stoves and 1823 coin-meters.

The Accounts.

Now, turning to the figures of the accounts, you will find that the capital expenditure is very small indeed—being only £2348, all of which was expended on services and stoves. The depreciation on coin-meters and fittings provides a capital credit of £1387, so that only £960 is carried to the debit of the capital account. The increase in the sales of gas, and the fact that there has been little or no capital expenditure for some time, is reducing the ratio of the capital to gas sold in a very satisfactory manner; and it is now (including coin-meters and services and ships) only £429 per million. Last year, it was £440 per million. On the revenue account, coals and oil cost more by £6441—coal costing on the average 1s. 6½d. a ton more than in the corresponding half of 1911. But this represents only part of the extra price we had to pay when we renewed our contracts. Residuals gave us a record yield of £63,221, which is £5463 more than in the preceding year; coke, tar, and sulphate all contributing their quota to the good results, which are due, not only to the record prices realized, but also to the extremely satisfactory quantities manufactured for sale. Thus net coals—that is, coals and oil, less residuals—only cost more by £978. Carbonizing wages again show a small reduction; and we spent a considerable sum less on repairs to plant than in the corresponding half of last year, when the expenditure under this head was unusually heavy. The sum spent this year is above the average. The cost of distribution naturally increases as the number of consumers is augmented. It is £4608 more than last year. A charge for Health and Unemployment Insurance appears for the first time in the accounts, and amounts to £470; and included in the item "Superannuations, &c.," is a charge of £276 for expenses of the Workmen's Benefit Society, of which £190 represents the Company's contribution for the half year. We have over 1000 members in the Approved Health Society, and 958 members in the Benefit Society; and I am convinced that, though the cost to the Company is considerable, we shall derive great benefit from both Societies. The men have another bond of union with the Company. They recognize that their employers care for their welfare; and in return they will do their part to promote the prosperity and well-being of the Company. To sum up the expenditure side of the revenue account. We sold 63½ million cubic feet of gas more than in the corresponding half of 1911, and it cost us £8367 more, leaving out of account the sum received from residual products. If we deduct the profit on residuals, the increased cost is only £2905. On the other side of the account, the sale of gas gave us £7115 more; and we received from rental of stoves and meters £2270 more, the net result of which is that the balance of profit carried to net revenue account is £78,617, as compared with £72,136 last year—an increase of £6480, and the largest profit ever made by the Company. Turning to the net revenue account, the charge for debenture interest is £7125—the same as last year; but the interest on floating loans is £488 less, because, instead of having to borrow, we have had money on deposit earning interest. The full statutory dividend will absorb £56,296; and we shall have left out of the half-year's profits a surplus of £14,650.

The Price of Gas.

This is amply sufficient to warrant the Directors in lowering the price of gas by 2d. per 1000 cubic feet; and most gladly would we do it, if we dared. But having regard to the price we are now paying for coals and oil, we cannot hope to have such a profit at the end of the current half year. Indeed, we are more likely to fail to earn our full dividend than to have a surplus after paying it. We recognize that it is of great importance to the consumers of our poor district to get their gas at the lowest possible price; but it is also important to them to keep the price as level as possible, and not to let it fluctuate. The sum of undivided profit to be carried forward—which will amount to £84,381, compared with £69,731 brought forward from last half year—will, I feel confident, obviate the necessity of raising the price of gas for at least two half years; and I hope it will be sufficient to tide over the period which may elapse before we can again buy our raw material at a more reasonable figure.

The Residuals Committee.

You will have seen in the papers that a Joint Select Committee of the House of Lords and House of Commons was appointed recently to inquire whether any, and if any what, restrictions should be imposed on gas authorities with respect to the purchase and manufacture of the residual products resulting from the making of gas by other companies and of other chemicals. The Committee was appointed because Parliament, at the instance of certain chemical manufacturers, had, in some recent Gas Acts, imposed such restrictions. The report of the Committee has just been issued; and they recommend that gas companies should be allowed to purchase chemicals for the purpose of working-up their own residuals, but not to manufacture chemicals exclusively from raw materials bought from other sources, nor where the use of their own residuals would be merely subsidiary. This Company would have been affected if the decision of the Committee had been to prohibit the purchase of chemicals altogether; but as it is, the decision is satisfactory to us. There is nothing else to which I think it desirable to draw your attention; and with the remark that, if we can buy our coals and oil at anything like reasonable prices, the prospects of the Company are as bright and as favourable as they have ever been in the course of its history, I beg to move the resolution.

The Deputy-Chairman (Mr. Walter Hunter) said that, after the very able and exhaustive speech of the Chairman, he did not propose

to add anything, except to congratulate the proprietors upon the prosperity of the Company, which he hoped would long continue. He had great pleasure in seconding the motion.

Mr. FRANK JONES asked, in the event of new fittings being sold direct by the Company to the consumers, how this would appear in the accounts.

The CHAIRMAN replied that the profit or loss went into the revenue account.

Mr. ENNIS thought that the shareholders had cause to congratulate themselves. In connection with the Chairman's explanation as to why it was impossible to reduce the price of gas, they must, he said, all approve of the decision come to, in view of the circumstances. He the speaker) knew—and they all knew—that a reduction would be made at the earliest possible moment. The remarks on the financial conditions, both at home and abroad, were most interesting to him personally, and he had no doubt they would be to the other shareholders. There was, however, one point in the Chairman's speech as to which he would like to say a few words—the depreciation on the reserve and insurance funds. There were two methods of carrying this out. One was the plan that was now adopted by the Board; of computing the depreciation, and dealing with it accordingly. Personally, he did not agree with this. The Company's reserves of £70,000 were, of course, really very moderate. The method he would more approve of would be to put the investments at cost, and make a distinct lay-by against the contingency of depreciation—not to alter the investment item. To his mind, the figuring in the accounts of the securities always at cost price was a preferable way of dealing with the matter to the one selected by the Directors. He wished to congratulate the Chairman on the excellent report he had submitted.

The CHAIRMAN said that he looked into the matter of reserves himself every half year. Mr. Ennis suggested that they should create an investment reserve fund. They had this, practically, in the amount carried forward; and while this sum remained where it was, the shareholders could deal with it as they pleased. But if the Board once allocated it to the investments, the shareholders could not do as they liked with it. He preferred to leave this power in the shareholders' hands. Then, again, if they did not touch their investments at all, their accounts would not be a statement of the actual condition of affairs. He thought the way the Board dealt with the matter was the most straightforward and the simplest method of doing it.

The resolution was then carried unanimously.

On the proposition of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, dividends were declared for the half year at the rates of £5 9s. 4d. per cent. per annum upon the 4 per cent. stock, and of £5 6s. 8d. per cent. per annum upon the 3½ per cent. stock, both less income-tax.

The retiring Directors (Messrs. H. W. Gell and H. D. Ellis) were next re-elected, on the motion of Sir FREDERICK GREEN, seconded by the CHAIRMAN; and the retiring Auditor (Mr. S. W. Savage) was re-appointed, on the proposition of Mr. OSBORN C. HILLS, seconded by Mr. F. JONES.

THE SALARY OF THE SECRETARY.

The CHAIRMAN said he now had to propose "That the salary of the Secretary be increased from £700 to £1000 per annum by such instalments as the Directors from time to time may determine." He explained that under the Act of 1845, the Directors were not allowed to fix the salary of the Secretary, which was left to the shareholders—why or wherefore he did not know. Mr. Bradfield was a most efficient and able officer of the Company. He had been with them about eleven years—first as Assistant-Accountant, then as Accountant, and since the retirement of their friend Mr. Ellis as Accountant and Secretary. He had won the esteem of all who worked with him. His work was admirably done, and was of the greatest possible use to the Board. Only this year he had proved his worth twice over, in connection with the tremendous amount of work over the National Health Insurance and Workmen's Benefit Societies. These had involved—and he was sure still involved—work night and day; and Mr. Bradfield had never spared himself. With regard to the profit-sharing scheme, he had given the very greatest assistance. All these things were outside the ordinary duties of Accountant and Secretary; and those shareholders who read the "JOURNAL OF GAS LIGHTING" would know also what an admirable analysis of the accounts of the Metropolitan and Suburban Gas Companies Mr. Bradfield prepared each half year—an analysis which was of great use to the Directors. The Company could not have a better officer.

The DEPUTY-CHAIRMAN seconded the proposition, which was supported by several shareholders, and carried unanimously.

VOTES OF THANKS.

Mr. F. JONES proposed, and Mr. WILSHAW seconded, a hearty vote of thanks to the Chairman and Directors; and it was cordially passed.

The CHAIRMAN briefly acknowledged it, and then called upon Mr. Hunter to propose a similar compliment to the officers, staff, and employees generally. They had, he said, the goodwill of the workmen, who did most admirable work.

The DEPUTY-CHAIRMAN, in complying, said he was sure the results put before the proprietors that day showed how excellently their Engineer (Mr. Stanley Jones) did his work; and he was supported by the whole of his staff. He was in the fortunate position of having had a father and grandfather before him whose names were household words in connection with the gas industry; and the mantle which they wore it was gratifying to see had descended on the present Engineer. They had in Mr. H. E. Jones a very keen critic; and he (the speaker) was sure he felt proud of the position his son had taken up. As to the Secretary, they had heard of the valuable services he rendered, and had shown by their vote that they were thoroughly appreciated.

The resolution having been seconded and carried unanimously,

Mr. STANLEY H. JONES said that, on behalf of himself, the staff, and the workmen, he could assure the proprietors that the vote that day was especially gratifying. The accounts just submitted were rather record ones. In fact, they surprised even those who had had to administer the affairs of the Company. But he was of a sanguine temperament, and he ventured to be sanguine regarding the present year. He believed the reserves the Company had would not be interfered with this year, and that they would play the game off their own bat without any difficulty. The Board had, under his advice, developed the stations of the Company by the installation of labour-saving appliances which had brought about a state of things that was not dreamt of when he took up ten years ago the position he now held; and they were at present reaping the benefit. It would be shown this half year even more than last. So that with various elements of this sort, he felt very optimistic, in spite of the high prices of coal and oil. As regarded the *personnel* of the staff, they had some exceedingly able men. In the Station Engineers, Mr. Williams and Mr. Gill, they had men who were second to none; and on their district they had extremely capable officers in Mr. Kelday and Mr. Tooth. The latter had patented gas-furnaces which were being installed in the Commercial district very extensively indeed. They had many big firms smelting metals, and glass and confectionery works, who were adopting gas in preference to solid fuel. There was a tremendous field for development here, and for their Company, in the district in which it was centred, more than in other parts of London. He had every hope that they would go on as they had been doing successfully; and while the Chairman had said that the price of gas would be reduced as soon as possible, he would like to point out that it was already at a modest figure—especially when the discounts given to big trade consumers were taken into consideration.

Mr. BRADFIELD said he wished to thank the shareholders for the very handsome vote of confidence they had given him. At the time of his appointment eleven years ago, Mr. Bradshaw told him that he had to "make good." He might not have used just these words; but it was an American phrase which expressed his meaning. Well, now he knew he had "made good." He also thanked the proprietors on behalf of the clerical staff for their vote; remarking that he would like everyone to realize the growing interest of his staff in the working of the Company.

BRENTFORD GAS COMPANY.

Over 90 Per Cent. of the Population Consumers—Further Reduction in the Price of Gas.

The Half-Yearly Ordinary General Meeting of the Company was held last Friday, at St. Ermin's Hotel, Caxton Street, S.W.—Mr. ULICK J. BURKE in the chair.

The SECRETARY (Mr. W. Mann) read the notice calling the meeting; and the report and accounts were taken as read.

The CHAIRMAN, in proposing their adoption, said it had been his privilege for several years to move this resolution at their half-yearly meetings; but he thought he had hitherto never done so with more assurance of the acceptability of the report and accounts to the shareholders than he did on this occasion. Looking to the troubles, drawbacks, and anxieties of some eighteen months ago, in the way of strikes at the coal-pits, strikes in various forms of transport, and misgivings as to delivery—nay, looking further to the *sequelæ* of these troubles still to be endured in the matter of high-priced coal—it was, indeed, most satisfactory to be able to present the proprietors with a report so indicative of good and prosperous work in the past half year, and so buoyant with promise for the vitality of the industry generally and of their Company in particular—and, he must add, with accounts showing no less than £150,453 available for dividends, and justifying a further reduction in the price of gas. Turning to the accounts, and comparing them with those of the corresponding period of 1911, they found very few items of increased outlay calling for special comment. The proprietors would note the sum of £410 paid under the National Insurance Act, which was a charge, of course, not within the control of the Board. There was an additional payment under repairs and maintenance of £2792, due partly to increased business, partly to the policy of keeping plant and machinery in first-rate order, and largely, also, to increased cost of all materials required. Then there was an increase in the matter of stove renewals, to the amount of £2737—an increase which they were always glad to welcome, as manifesting development in a growing and very important branch of their business. He need hardly tell the many experts present that the stove branch meant daylight consumption; and they would remember the trouble gas undertakings had many years ago with the large amount of capital lying idle during daylight. It was gratifying to find everything fully employed now in the daytime. Recently the Board had some figures put before them which revealed a very remarkable fact—namely, that the biggest daylight consumption seemed to be at about mid-day on Sunday, just when the dinner was being cooked. This was satisfactory, as showing what was being done in the matter of cooking by gas. Reverting to the accounts, there was also, however, as might have been noted, a large increase of no less than £8077 in the cost of coal, as to which, and as to the Board's policy in regard to it, a few words appeared to be necessary. The heavy increase in the price of coal was engaging the serious attention of all gas companies—and, indeed, of all industries dependent on coal for carrying on their business. Whether economic forces might eventually bring about a lowering of prices, would seem to be a doubtful matter; and he regretted to say that present appearances pointed rather to co-operation among coalowners, tending to the making of monopoly. And, meantime—since punctual delivery at home seemed to be hampered by the meeting of foreign demands—many of them were inclined to think that the time had come for the re-imposition of such an export duty as would tend to a better consideration of home requirements. It certainly seemed to him that the home consumption was more entitled to consideration than the foreign consumption. As regarded their own Company, the increase of £8077 in the coal bill was, of course, partly due to increased business, and partly, also, to their having made new contracts, merging unexpired contracts, for an extended period. He might say that the policy of the Company in regard to coal supply had been to secure future stock as far as reasonably prudent. The proprietors would remember that foresight in this direction enabled the Company to tide over the coal strike and other

troubles of last year without any extra charge to the consumers; and it would, he thought, be gratifying to the shareholders to know that the present contracts—given punctual delivery—secured the supply of coal up to the end of December, 1914, or practically for two years to come. There were those, of course, who deprecated these forward contracts, on account of a probable fall in coal prices; while others, again, seemed to look on high prices as likely to continue. Indeed, the one thing certain about the problem appeared to be its uncertainty. However, looking to their experience during the coal strike, the Directors held that the satisfaction given to the consumers in that trying time, the large extension in the cooking and heating consumption consequent on their readiness to supply, and the very useful and practical advertisement of the gas stove and cooker, were matters worth paying for, and worth incurring some risk over, even should lower coal prices obtain during the currency of their contracts. Having dealt with what might seem the adverse side of the accounts, it was gratifying on the other side to note an increase in the gas and stove rental of £16,146—and this at a price of gas of 2s. 5d. per 1000 cubic feet, as against 2s. 7d. in the corresponding half of 1911. There was also an increase on the sale of coke amounting to £7383, and on the sale of tar amounting to £2565—the increased receipts from residuals thus practically meeting the extra price of coal. He was happy to tell them that the half year had passed without any special matter affecting the prosperity of the Company. They had been admirably served, as they always were, by Mr, Johnston and by all the officers and staff, and, he might add, by the workmen also; and their labours had resulted in the very satisfactory figures shown in the report—namely, a profit on the revenue account of £61,778. This sum, after providing for fixed charges, left £57,896, and added to the balance from last account made a sum of £150,453 available for dividends. The Directors, therefore, recommended the declaration of full and increased dividends on the various stocks. As to increased gas consumption, it was interesting to know that the number of consumers now exceeded 101,000; and comparing this figure with the 1911 Census returns for the district, went to prove that well over 90 per cent. of the population in the area served by the Company were using gas. Now, a few words as to the future, and he had done. They would observe that the increase in the gas output for the half year had been no less than 10·24 per cent.—despite what might be called unfavourable weather on the whole for gas consumption. Latterly, there had been some fogs, &c.; but taking the period all through, it had been a very bad gas half year. Though the price of coal was a serious factor to be considered, the Directors felt that, with contracts entered into as already advised, they were justified in making a reduction in the price of gas of 1d. per 1000 cubic feet. The proprietors all knew that reduction in the price of gas and reduction in the capital per ton were, and had been for many years, the policy of the Brentford Gas Company. In 1906, the capital stood at 9s. 9d. per 1000 cubic feet; whereas at the present time it only slightly exceeded 7s. 6d.—showing an improvement of no less than 23 per cent. But the Board felt, as ever, that efficiency in plant and machinery—in other words, in the capacity to meet demands—must be their first care; and in this regard, they could not look without concern on the almost congested state of the Brentford works. He mentioned this specially because the position might necessitate some capital outlay. The shareholders might depend upon the Board giving this matter their close attention; and, in the meantime, he was pleased to congratulate them, not only on the soundness, but also on the promise of growing prosperity of the undertaking.

Mr. R. J. Neville Neville, M.P., seconded the motion; and it was at once carried unanimously.

Dividends were next declared, subject to income-tax, at the rates per annum of 5 per cent. on the preference stock, 14 per cent. on the consolidated stock, and 11 per cent. on the new stock (1881).

The retiring Directors (Mr. Burke, Mr. Neville, and Mr. D. Milne Watson) were then separately re-elected, on the motion of Mr. R. S. Adair, seconded by Mr. T. Wilkins and other shareholders; and the Auditors (Messrs. Monier F. Monier-Williams and Alfred Bevis), on the proposition of Mr. Hatchwell, seconded by Mr. H. D. Ellis.

Mr. Ellis, in proposing a hearty vote of thanks to the Chairman and Directors, and the officers, staff, and workmen, said he did not think there ever was a time when it was so incumbent upon them to cordially pass such a vote as he now suggested. The accounts before them must have exceeded the expectation of all the proprietors—and perhaps even of the Board themselves. He did not intend to go through the accounts and labour the figures; but he would like to draw attention to one or two points. In spite of the position of the coal market, owing to the prudence and foresight of the Directors in dealing with their contracts for coal, the result was that, when they came to compare the cost of coal in the past half year with that in the corresponding period of 1911, the difference was not quite equal to what the increase in the sale of gas had been—namely, 10¼ per cent. So that really they might say the increase in the money was wholly owing to the increase in the business done. When gas undertakings had been suffering from the high price of coal, this was surely a very extraordinary circumstance; and they were deeply indebted to the Directors for so managing the contracts. Then the Chairman had referred to the amount of capital expended per 1000 cubic feet. He (Mr. Ellis) had just looked into the accounts, and saw that, as compared with the corresponding period of 1911, the capital expenditure was really lower by no less than 5¾d. per 1000 feet; and when they remembered that 1d. meant £6700, they would realize that this represented a very large reduction. Similarly, the whole expenditure, in spite of the rise in coal and everything, as compared with the corresponding period of 1911, was actually less by 2¼d. per 1000 cubic feet. These figures were rather staggering to him; but they were facts, and meant splendid results, on which all those connected with the working of the undertaking were heartily to be congratulated.

The vote was seconded by Mr. Edgecumbe Rogers, and carried.

The Chairman, in acknowledgment, said it was very gratifying to have an expert like Mr. Ellis giving such an analysis of the accounts. The results were rather a surprise to the Board, and he need not tell them what a large proportion of the credit for them was due to the officers and staff. The Directors were rather inclined to think they had in the past half year been better served than ever.

LIVERPOOL UNITED GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday—Mr. H. Wade Deacon presiding.

The Chairman, in moving the adoption of the report, remarked that, the meeting being a half-yearly one, there were no accounts to present; and therefore he had nothing to say with regard to figures. It was, however, pleasing to state that the half year had been of an extremely satisfactory character. There had been an increase of rather more than 8 per cent. in the consumption of gas; and it was gratifying to know that about half of it was due to its use by old consumers, who had been employing it for heating and cooking purposes. The Directors had decided to take out some of the old and obsolete plant, and replace it with new retorts of the most modern construction, which would enable them before next winter to meet all possible requirements. The increased price of fuel had given them some concern. There had been a large advance in the price of raw material; but, in spite of this, they had decided not to raise the price of gas, for, with the new apparatus in use, it was possible to work more economically than formerly. In conclusion, the Chairman referred to the satisfactory results of the co-partnership scheme, and said he believed that the good relations which had existed between the Company and their servants would be greatly strengthened.

Mr. J. E. Tinne seconded the motion; and it was carried.

Dividends for the half year of £5 per cent. on the ordinary consolidated "A" stock, and £3 10s. per cent. on the 7 per cent. "B" stock, were declared.

CROYDON GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Company was held last Friday, at the offices, Katharine Street, Croydon—Mr. Charles Hussey, J.P., in the chair.

The Secretary (Mr. W. W. Topley) read the notice calling the meeting; and the Directors' report and the statement of accounts were taken as read.

A Distinguished Colleague.

The Chairman, in moving the adoption of the report and accounts, said he was sure he would be acting in accordance with the wishes of the proprietors if he first expressed the pleasure they had all felt in noting the honour recently conferred on their distinguished fellow Director, Sir Corbet Woodall, and through him upon the industry of which he was the acknowledged head. They trusted that he might be spared for many years to enjoy the well-deserved honour, and to continue his useful work. It would take too much time, and would, he was sure, be distasteful to Sir Corbet, were he to attempt an account of his many and varied services to the gas industry during the past fifty years and more. But it was of special interest to note that, largely through his great influence and good offices, the bodies chiefly representative of the industry and its interests—the Institution of Gas Engineers and the Society of British Gas Industries—had joined in the formation of a third body, the British Commercial Gas Association, whose efforts were devoted to making more widely known the advantages of the use of gas. In the new Association, in whose counsels subscribing gas undertakings were also directly represented, all branches of the industry had joined forces to promote one common object. The gratifying increases in business which they and many other undertakings had recently been able to record had, he believed, been due largely to this common action. The benefits were being felt by all; but so far the cost of the work was being borne by some only, though, he was glad to learn, by steadily increasing numbers. He hoped that, to a growing extent, the undertakings which had not so far seen their way to make common cause with their neighbours would join their ranks. This year marked the opening of the second century of statutory gas supply, and he should have occasion later to refer to what was being done to celebrate this anniversary.

A good half year.

The Company's own record for the half year was a successful and, he trusted, to the proprietors, a gratifying one. The sales had increased; the number of the customers had grown; and the number of appliances of which the consumers were making use had increased in an even greater degree. A comparison of the year 1912 with 1911 would make clear how rapid the recent progress had been. The sales of gas for the year had increased by 115 million cubic feet, or nearly 9 per cent. The number of consumers had advanced by 1460, and that of stoves on hire by 4244—the latter increase being equal to more than 14 per cent. The receipts from the sales of gas had advanced by £8240, notwithstanding reductions in price equivalent to £6300. Had they been selling gas at 2s. 6d., instead of 2s. 5d., they would have had £3200 more with which to deal. The receipts from the rental of meters, stoves, and fittings were £2335 more; and for residuals, £6610.

Saving one cause of development.

It was interesting to consider what might be the causes of this great development of the undertaking. Much of it was undoubtedly due to the vigorous policy pursued in the Sales Department, and to the able and strenuous efforts of Mr. Sandeman, who was thoroughly well backed up by his staff, and by all the workmen under his charge. But there had been, he thought, other causes at work which had helped the Company. They had passed through a time when coal had been abnormally dear; and they had been selling gas at the lowest price in their history. The increased cost of coal to the householder in 1912 as against 1911 had been, on an average, fully 2s. per ton. If this increase were expressed in terms of the 88,000 tons of coal which were carbonized by them in producing the gas used by their consumers, they got £8800, and, adding to this the £6300 arising from the lower prices charged for the gas sold, they had a relative gain to the consumers of upwards of £15,000 in one year. This could not but have an influence on the use of gas. There was every indication that, during at all events the next twelve or eighteen months, the price of coal would be even

higher than now; it might be feared be much higher. This would impose a heavy burden upon the Company—a burden only partially lightened in their case by the better receipts they might look for from the sale of coke. But they would endeavour not to increase the price of gas; and they would get their reward by a further extended use of gas for cooking and heating, as well as for lighting. In the early part of last year, the coal strike, with the consequent uncertainty as to supplies, undoubtedly had a marked effect in turning the consumers' attention to the reliable service which experience had shown them they could get from gas. The almost phenomenal growth in the number of stoves in use testified to this; and modern gas-fires were now of such a character that the installation of one led to a demand for others. As in many other matters, it was only the first step which counted.

NATIONAL GAS EXHIBITION.

It had been decided that this year there should be held at Shepherd's Bush, during the month of October, a National Gas Exhibition. This would be on a scale, and of a character, not heretofore attempted. It would be designed as a co-operative exhibition by gas undertakings and by manufacturers of gas appliances; and while wearisome duplication would be eliminated, every department of domestic life and of trade in which gas could be used would be adequately represented. The cost of the exhibition would be considerable. Their own contribution to it had been £164. But he was sorry to learn that so far the gas undertakings of the country had not shown, as a whole, so much promptitude as had the trading firms in subscribing. Many of the proprietors were doubtless interested in other gas companies; and he would urge, for the sake of their common good, that those proprietors should bring such influence as they might possess to bear upon the companies that had so far stood aloof.

SUPPLY TO OUTLYING DISTRICTS.

To return again to the Company's more immediate concerns, the gas-mains to Woldingham had now been completed; and they were securing a good number of consumers among the occupiers of large houses there, several of whom were finding it worth while to discard their private acetylene or petrol gas installations in favour of town gas.

SHOW-ROOM, OFFICE, AND WORKS EXTENSIONS.

The Directors had just arranged for the purchase of property at Norbury; and they purposed to erect there a district show-room, with stores and offices, to enable them to better meet the needs of consumers in this rapidly growing portion of the borough. The proprietors would have noticed that considerable progress had already been made (not any too soon) with the buildings which would form an extension of their main offices. At the works, plans had been approved, and some of the contracts let, for a modern scrubbing and washing plant for No. 1 section, which would displace that erected 47 years ago when the Waddon works were first opened. It had been decided also to proceed with the erection of an additional gasholder of a capacity of nearly 6½ million cubic feet; and plans for this were being prepared. The last gasholder of 3 million cubic feet capacity was brought into use over seventeen years ago, since when the annual sales of gas had increased from 561 to 1471 million cubic feet.

POINTS FROM THE ACCOUNTS.

To take the accounts in more detail, there was the extra cost of coal, partly offset by better results obtained from residuals. They had again to thank Mr. Caddick and the staff and workmen at Waddon for extremely good working results in the manufacturing department, resulting in an actually lower cost per 1000 cubic feet in the holder than last year when coal was much less in price. The gas made per ton of coal worked out at 12,698 cubic feet, which surpassed the good results of last year. The charge under the head of repairing and renewing meters showed a large increase. This was due mainly to an altered method of charging depreciation; and the future charge would not be so heavy as that for the past half year. A heading "State Insurance" would be noted in the accounts for the first time. He explained in August last what had been done to meet the altered position of the men arising from the National Insurance Act; and the proprietors would, he thought, be glad to learn that in their case the difficulties foretold when last month the benefits of the Act came into operation had not been experienced—at all events, so far as the Company's men were concerned. The cost to the undertaking of the capital employed in it had been for some years a steadily diminishing one. With the large capital expenditure he had foreshadowed, this diminution might for the next few years be lessened; but he hoped and expected that the general tendency would remain in the same direction. The profits for the half year had enabled the Directors to apply £2326 to writing-down investments—in the case of Consols, from 80 to 75—to carry £2500 to the renewal fund, and to increase the carry-forward by £2646, to a sum of £24,431, or well over the amount required for the next half-year's dividend. These results, during a half year of dear coal, the proprietors would, he hoped, regard as eminently satisfactory.

The DEPUTY-CHAIRMAN (Mr. T. Rigby) seconded the motion. He remarked that the report was an excellent one, and showed good working in all departments. Those of the proprietors who had gone into the figures, would agree that the undertaking was never in sounder condition than at the present time.

Mr. CHARLES WEBB asked if the dividends the Directors were about to recommend were the full statutory ones under the sliding-scale, and whether, in the event of any increase in the price of gas, this would interfere with the dividends?

The CHAIRMAN replied that they were not the full statutory dividends. The Directors could increase the price of gas by 6d. per 1000 cubic feet before reducing the dividends.

The motion was unanimously carried.

Sir CORBET WOODALL moved the declaration of dividends at the rate of 15 per cent. on the "A" stock, 12 per cent. on the "B" and "C" stocks, 5 per cent. on the "D" stock, and 10 per cent. on the "E" stock, all less income-tax. He remarked that after the Chairman's address, and the answer to the question put by Mr. Webb, the proprietors might be perfectly content to pass the resolution with easy minds, knowing that the dividend had been well earned. The advance made by the Company was remarkable in its amount, but not remarkable he thought having regard to the circumstances since they last met. The increase in the cost of solid fuel had been very large; and it had been immensely to the advantage of gas companies that they had been able to keep the price of gas so low as they had done. He felt now that what they had to do was to strive very hard indeed to see that the price was not raised, except under the circumstances of the most urgent and absolute necessity. He felt sure that the staff and the workmen (of whom he was delighted to see a few representatives present at the meeting) would do all in their power to maintain, and even improve, the position of the Company so as to avert that necessity.

Mr. WILLIAM CASH, F.C.A., in seconding the motion, remarked that, during the whole of 1912, the Company maintained its position very well. This was a matter of some importance in view of the increased cost of coal, which would probably be a burden during the ensuing twelve months. In the past year, they had written-off works £4000, written-down the investments by £2326, added to the renewal fund £4500, and to the "carry-forward" £4797, and, in addition, they were paying the dividends now recommended. The four figures he had mentioned amounted to £15,600—all to the good. One other fact reported to the Directors that day, which showed how markedly gas companies responded to the demands made upon them arising from the variation of temperature and so forth, was that, during the four days ending on Wednesday last, there had been an increase of no less than 20 per cent. in the amount of gas sent out, compared with the corresponding four days of last year.

The motion was unanimously carried.

Proposed by Sir CORBET WOODALL, and seconded by the DEPUTY-CHAIRMAN, Mr. Charles Hussey was re-elected a Director of the Company. It was mentioned by Mr. Rigby that the Chairman had been a Director 23 years, and had been Chairman just over 21 years.

Proposed by Mr. PERCY H. HALL, and seconded by Mr. W. J. RUSSELL, Mr. Samuel Spencer was also re-elected a Director.

Moved by Mr. MAITLAND, and seconded by Mr. SAMSON, Mr. John Jones was re-appointed an Auditor of the Company.

On the proposition of Dr. CRITCHLEY, seconded by Mr. SAMSON, the remuneration of the Directors was increased by £350, free of income-tax. The proposer gave a number of statistics showing how the business had grown since the fees of the Directors were increased in 1905.

FIFTY YEARS' SERVICE.

The CHAIRMAN said he had another pleasing duty to perform on this occasion. One of the Directors had completed fifty years' service in connection with the Company. Mr. Russell began work with the Company, in February, 1863, as an office boy. From office boy, he became assistant to the Secretary, and in good time he was raised to the secretaryship, and, as they all knew, he eventually arrived at the proud position of being a Director. That was on his resignation of the secretaryship in 1901. He (the Chairman) knew Mr. Russell quite well when he was assistant to Mr. Purves, who was his predecessor in the secretaryship. He had watched him, and seen the work he had done for the Company; and now that day he (the Chairman) had been asked to present their friend with something of which he knew he would be proud. It was nothing in the shape of plate or anything of that sort, because he knew Mr. Russell was blessed with plenty of worldly goods of that kind. They were giving him something of which he would be proud, and which his family would be proud to look upon in years to come. When Mr. Russell commenced his office work, gas was selling at 5s. per 1000 cubic feet; and the receipts from the sale of gas that year were £10,675. In 1912, when he had completed his fifty years' service, the gas-rental amounted to no less than £203,500. Imagine what that sum would have been if they had been selling gas at 5s. instead of 2s. 5d. The advance had been an enormous one. He was going to ask Mr. Russell to accept a framed engrossed appreciation from the Directors and the staff on the completion of his fifty years' service.

The present was handed to Mr. Russell amid the applause of the proprietors.

Mr. RUSSELL remarked that the presentation had taken him quite by surprise. He thanked the Chairman for his very kind words, and sincerely thanked his co-Directors, Mr. Helps, Mr. Topley, and the staff and workmen for their congratulations to him upon the completion of his fifty years' service. He should highly prize the testimonial, together with the gifts to him on his retirement in 1901—a silver salver from the Directors and staff, and a silver hot-water jug from the workmen. He thanked all for their kindness to him over the long course of years.

RETURN OF MR. HELPS.

On the motion of Mr. C. E. BOTLEY, seconded by Mr. JOHN JONES, a hearty vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN, having responded on behalf of himself and his colleagues, proposed a vote of thanks to the officers, the staff, and the workmen. He remarked that it was a great pleasure to them all to see Mr. Helps with them again, though he was not in such robust health as they could wish. He had nothing but good to say of Mr. Helps, Mr. Topley, Mr. Caddick, and Mr. Sandeman. Each and all gave the best of service. All the men at the works and in the district were doing splendidly, and the best they could do in the interests of the Company.

Mr. SAMUEL SPENCER seconded the motion, which was cordially agreed to.

Mr. J. W. HELPS, who was cheered when he rose, thanked the Chairman very heartily for the kind way in which he had referred to the services of the staff and workmen throughout the Company's system. It gave him great pleasure to have the opportunity of again responding to this resolution; but he felt that he was occupying a very false position, because he had been absent for such a large part of the year from the works that he had had little to do with their successful operation. Mr. Caddick ought to have had the pleasure of occupying his place that day. He could not tell how deeply he had appreciated the kindness and loyalty of Mr. Caddick; and he must congratulate him upon the splendid work that he had done. He also thanked Mr. Topley for the kindness and loyalty he had shown him, through the way in which he had made his (Mr. Helps') absence as little harmful

to the Company as possible. The same must be said of Mr. Sandeman. He was also glad to see some of the workmen present that day, for he knew how much they appreciated the consideration the Directors showed them. He was now completing his thirty years' service with the Company; and, during the whole of that time, he had never had any trouble with the workmen, and had enjoyed every minute he had spent on the works.

Mr. TOPLEY also expressed the appreciation of himself and his staff of the vote and the incentive which the Directors gave them all to be true to the interests and prosperity of the Company.

THE WANDSWORTH, WIMBLEDON, AND EPSOM DISTRICT GAS COMPANY.

The First Report Under the Amalgamation.

In view of the meeting of the Amalgamated Company on the 4th prox. (this time at the Westminster Palace Hotel), the Directors have circulated their report and accounts dealing with the affairs of the concerns, which will henceforth be known under the above title. Mr. Henry E. Jones is, of course, the Chairman of the enlarged undertaking; and the Deputy Chairman is the Chairman of the late Mitcham and Wimbledon Gas Company (Mr. R. Garraway Rice). The other Directors are: Messrs. W. G. Langlands, Mr. T. A. Ives Howell, Mr. G. F. Page, Mr. H. S. Freeman, Mr. Robert M. Chart, Mr. J. Bromley Howell, and Mr. Frank H. Jones. The Engineer of the Company is Mr. H. O. Carr, and the Secretary Mr. Chas. W. Braine. The Directors first report the passing of the Amalgamating Act, and one or two resulting matters relating thereto. Proceeding, the report states:

As from Jan. 1, 1913, the price of gas has been reduced to 2s. 5d. per 1000 cubic feet in the area lately supplied by the Mitcham and Wimbledon District Gas Company, and to 2s. 10½d. per 1000 cubic feet in the area lately supplied by the Epsom and Ewell Gas Company. These reductions have been made in accordance with the scale prescribed by the Act, and were felt to be fully warranted by the circumstances.

Action was early taken by the co-operation of the separate Boards to prepare for the working of the new Act; and during the autumn connections were made between the arterial mains of the Wandsworth and Putney Gas Company, and of the Mitcham and Wimbledon Company, so as to give more effective distribution and a better interchange between the manufacturing works at Wandsworth and Mitcham respectively. These works were so far successful that a considerable increase in the sale of gas was realized without any strain on the respective works of supply. There have been further considerable modifications of the plant at the Wandsworth Gas-Works, with a view to economical operation for the new Company. The cost of all these works has added so little to the capital of the respective undertakings that the proportion of each was reduced in relation to the sale of gas, and stands at the low figure of 6s. 7½d. per 1000 cubic feet sold for the Wandsworth, and 6s. 11½d. per 1000 cubic feet sold for the Mitcham undertakings respectively. All three undertakings were in such a position as would have necessitated the raising of fresh capital early in the present year, by reason of the growth of their businesses. It is therefore necessary that the Directors should be authorized to issue ordinary and debenture stock; and resolutions dealing with this will be proposed at the meeting.

In pursuance of the Act, the General Manager of the Mitcham and Wimbledon Gas Company and the Secretary of the Epsom and Ewell Gas Company have retired.

The Directors for the time being are appointed by section 44 of the Act of Parliament, commencing to retire by rotation at the meeting to be held in February, 1914. It is necessary to fix their remuneration, as well as that of the Secretary and the Auditors; and resolutions for these purposes will be submitted at the meeting. Under the new Act, two Auditors have to be appointed (one of whom must be a member of the Institute of Chartered Accountants or of the Society of Incorporated Accountants and Auditors); the retiring Auditors having to be compensated. For the vacancies thus arising, Messrs. E. L. Burton and H. W. Smith, who are duly qualified, present themselves for election.

BRIGHTON AND HOVE GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at Winchester House, E.C., on Friday last—Mr. A. M. PADDON (the Chairman) presiding.

The SECRETARY (Mr. Ernest L. Burton) read the notice convening the meeting, and the report and accounts for the six months ended Dec. 31 were presented. The Directors stated that, in comparison with the results for the six months ended Dec. 31, 1911, the sale of gas had increased by 44,797,600 cubic feet, or 6·7 per cent.; and the revenue from residual products was £3061 more. The profits for the half year, including £123 received for interest, amounted to £34,328, to which was added £33,359 brought forward; making a total of £67,687. After charging income-tax, interest on debenture stock, &c., and appropriating £1800 to the capital redemption fund, a sum of £62,715 was available for distribution; and the Directors recommended the declaration of dividends for the six months at the statutory rates per annum of 6 and 4 per cent. on the "B" and "C" preference consolidated stocks; 11 per cent. on the original ordinary consolidated stock; and 8 per cent. on the "A" ordinary consolidated stock. This appropriation would require £23,424, and leave £39,291 to be carried to the profit and loss account for the current half year.

The CHAIRMAN, in moving the adoption of the report and accounts, remarked that in the period in respect of which the latter were presented to them there was nothing exceptional or abnormal; the different items preserved their relationship to those of the corresponding six months with almost a monotony. This was, to his mind, as things should be. They would observe from the accounts an increase in the period they were considering of nearly 45 million cubic feet of gas, or 6·7 per cent. They were not accustomed to important increases in this Company; and therefore the percentage mentioned was entirely gratifying. The sale of 709,845,800 cubic feet of gas, and the production of 12,260 cubic feet per ton of coal, were extremely satisfactory, while the unaccounted-for gas, 4 per cent., was a remarkable figure. Referring to the unsatisfactory condition of the coal market, the Chairman said happily they were not wholly dependent upon coal. They used oil; and he ventured to say that if they could get their coal on the same favourable basis as the oil, they would have nothing to complain about. Nevertheless, it looked very much as if they would have to face rather ominous times with regard to their coal, and it was only by following a conservative policy that they could hope to meet inequalities and work satisfactorily.

Mr. R. HESKETH JONES seconded the motion; and it was carried.

The dividends recommended were declared; Messrs. Colley and Phillips were re-elected Directors, and Mr. W. Cash as Auditor; and votes of thanks were passed to the officers and staff—Mr. Joseph Cash (the Engineer) and Mr. Burton responding.

GREAT GRIMSBY GAS COMPANY.

The Dividend Question.

In the "JOURNAL" for the 30th of July last (p. 332), there was a letter from a holder of stock and shares in the Great Grimsby Gas Company, calling attention to the dividends paid, and giving an epitome of correspondence on the subject which had taken place between him and the Secretaries of the Company, extending from January 17 to June 29, 1912. The last communication received by our correspondent was to the effect that the Board had not been able to resume consideration of his letter. At the meeting of the Company last week, the Chairman made the following remarks on the matter.

In January, 1912, the Directors received a letter from one of the shareholders, suggesting that the time had arrived when the full statutory dividend of 10½ per cent. should be paid on the £10 shares under the sliding-scale. I would point out, as no doubt the shareholder knows quite well, that the rates of dividend, while recommended by the Directors, are passed by the shareholders at the general meeting; so that the proper course to take would be for an amendment to be moved to the motion regarding dividend, and a vote taken. The Directors agree that a shareholder has a perfect right at a shareholders' meeting to ask any questions regarding the balance-sheet; but they do not consider that it is in the best interests of the Company for them to discuss by letter with any shareholder the reasons for their policy in regard to the Company's affairs. I can assure those present that the Directors wish in every possible way to look after the interests of the shareholders; and when by reason of the reduction in the price of gas, they were able to increase the dividend on the sliding-scale capital, they did so until it reached the same rate as that paid on the "A," "B," and "C" stocks. They were advised, however, that the only way of putting money to the new capital reserve fund was by not paying the full statutory dividend; and it was their opinion that the best policy was to strengthen the new capital reserve fund. In their reports, they have recommended this; and the shareholders present and by proxy resolved accordingly. At the time the letter already referred to was under consideration, the Directors were in communication with the Auditors regarding the correct reading of some of the clauses of the 1885 Provisional Order; and as these had also a bearing on the new capital reserve fund, they thought it well to have Counsel's opinion on the matter. The opinion of Mr. C. J. Talbot, K.C., was therefore taken; and, as he states clearly that any deficiency of dividend on the sliding-scale capital cannot be made up from the carry-forward or any other funds of the Company than the new capital reserve fund, the Directors did not think it wise to alter the policy that they had hitherto adopted of carrying ¼ per cent. to the reserve fund. The Directors themselves own a large proportion of the sliding-scale capital. Owing to the great increase in the price of coal and materials, it was decided in June last to increase the price of gas 2d. per 1000 cubic feet; and this was duly advertised in the current Press and on the face of the gas accounts. By reason of this increase in price, the dividend on the sliding-scale capital is now reduced to 9¾ per cent., which is the rate recommended to be paid on the last half year in the Directors' report.

ALDERSHOT GAS AND WATER COMPANY.

The Use of Gas for Power.

The Half-Yearly Meeting of the Aldershot Gas, Water, and District Lighting Company was held on the 14th inst.—Mr. W. T. Robertson, J.P. (the Chairman), presiding.

The GENERAL MANAGER AND SECRETARY (Mr. R. W. Edwards) having read the notice convening the meeting, the report and accounts for the six months ended Dec. 31, some figures from which were given in the "JOURNAL" for the 4th inst. (p. 342), were presented.

The CHAIRMAN, at the outset of his remarks, referred to the increased cost of coal and oil, and to the fact that, notwithstanding this, the Directors decided to reduce the price of gas 2d. per 1000 cubic feet. They admitted that this was a bold step; but they had confidence that the consumers appreciated their endeavours to give them a good and cheap supply of gas, and that the reduction would lead to increased patronage which would in some small measure contribute to the extra cost of coal. They also hoped and believed that their employees, who were now co-partners, would strive to their uttermost to assist the Company in at least retaining its present position and the low rates of gas. There had been an improvement in the residuals markets, which went towards meeting the extra cost of coal. The next interesting point was the satisfactory progress in the sales of gas. A year ago their comparative increase represented nearly 5 per cent., and six months ago 6·4 per cent.

They had now to report 6·2 per cent. This was extremely satisfactory, and showed how the Company continued its normal path of expansion. Referring to the use of ordinary gas for motive power, the Chairman suggested to all thinking business men that, when the necessity arose of considering either renewal or extension of power plant, they should think seriously of employing engines driven by gas, as it would be found that not only did the price compare favourably with other systems, but that there were other factors of importance—viz., reliability, economical day-to-day running and labour charges, and low upkeep. The Directors had so much confidence in it that they had furnished a complete water-works with four large sets of gas-driven pumps; their gas-works small electric station had at present two, and later there would be three, gas-driven electric plants; and in their scheme of electricity supply for public purposes in the out-districts, they were perpetuating the same policy by putting down gas-engines for generating current there. After reference to the result of the residuals inquiry, the Chairman concluded by moving the adoption of the report and accounts.

The Vice-Chairman (Dr. F. Stroyan) seconded the motion.

Mr. A. F. Wilson, one of the oldest Directors of the Company, offered a few remarks at the invitation of the Chairman. Referring to the use of gas for motive power, he said he probably was the first one to employ gas-engines for pumping water; and he had done so against a very strong opinion expressed to the contrary by many. But now they were generally told that gas, in the shape of machinery, was a pumping power superior to any other.

General satisfaction having been expressed with the report and accounts, the motion was carried unanimously.

The two retiring Directors (Mr. W. T. Robertson and Dr. Stroyan) were then re-elected; and the usual votes of thanks were accorded to the Chairman, Directors, and staff.

The Chairman acknowledged the vote on behalf of his colleagues and himself, and Mr. Wilson paid a tribute to the business ability displayed by the General Manager and Secretary, which, he said, had earned the success that had been secured.

Mr. Edwards, in reply, said he appreciated the vote very much, though he admitted that no man could have a better staff. Referring to the co-partnership scheme, he said it was a matter for congratulation to see not only the chief members but the most minor members of the staff seated at one common table, all taking an individual interest in the affairs of the Company, who recognized that in working for the success of the Company they were also looking after and securing their own.

BOURNEMOUTH GAS AND WATER COMPANY.

The Transfer of the Christchurch Gas Company and Wimborne Water Company—Capital Authorization—Directors' Remuneration.

The Ordinary General Meeting of the Company was held last Friday, at the London Offices, No. 90, Cannon Street, E.C.—Mr. G. Crispe Whiteley in the chair.

The Secretary (Mr. H. A. Plumb, F.C.A.) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read.

The Chairman, in moving their adoption, said that, for many years past, it had been his good fortune to bring before the proprietors every half year a very satisfactory report and accounts. He was glad to say the present occasion was no exception to the excellent rule. Indeed, in certain matters, the present report and accounts were even more remarkable than some that had gone before. There had been a 12½ per cent. increase in the sale of gas, and this, coming after a half year of exceptional mildness, was, he thought, a very special feature with regard to the progress of the Company. The increase, he was glad to say, was proportionately an all-round one—having been contributed to by the ordinary and prepayment systems, power, and public lighting. A remarkable point, too, had been the increase in the sale of gas apparatus. In former periods and earlier times, they had been content and pleased to let out for hire these things, in order to encourage their consumers to burn gas for purposes other than lighting; but they not only now let apparatus on hire, but there was a marked increase in the purchase outright by their customers. It might therefore be of interest to the proprietors to know that last half year the Company sold no less than 1106 fires, 178 cookers, and what was even more pleasing in some respects (because it was getting to a certain extent a novelty) was they had sold 80 water-heating appliances. When he said this, he did not mean merely the ordinary geyser, but a complete installation for heating water throughout the whole of the premises of a consumer. This was all very satisfactory; but he must point out to the proprietors that this continual increase had brought with it the necessity for an extension of works. They were about to erect a 2½ million cubic feet holder, and were going to put up a new retort-house and purifier-house. This would require money; and the proprietors and others he had no doubt would give it to the Directors, because he hoped they were satisfied with the way the Board had dealt with their money in the past. Only a few weeks ago, the Directors called up £10,000 of debentures. Some of his friends in the City rather laughed at him, when he said they were applying for £10,000 at 4 per cent. They not only got the amount required, but they might have had £20,000 if they had asked for it. He had no doubt whatever that they would get the money to meet their increased necessities. Except to refer to the very satisfactory state of the accounts, he did not think there was any particular feature in them to which to call attention. In the interest of pure and sound finance, the Board had written-down the whole of the securities to their market value on Dec. 31. In order to meet this, they had placed £500 on the other side of reserve, so that they would be none the worse off for their proceeding. Of course, there was another side to this joyous account—that was, the question of the price of coal. This was going against gas companies at the present time. He was not disposed to prophesy; but they were all he believed, on the Board and elsewhere, very clear that there was no justification—no really fair justification—for the present price of coal, which they were asked to excuse for such reasons as the Eight Hours, the Insurance, and other Acts, and strikes. These were not sufficient in themselves to warrant anything like the present prices now being asked. Probably demand and supply had something to do with the position—perhaps a good deal; and while the demand was as great as it was, no doubt the matter to a certain extent was in the hands of those who had got the coal to sell. If this was so, it must remedy itself in due time, because industries could not possibly prosper, if the price of coal was to be kept at the present rate. That was all he had to say on the ordinary half-year's working. The report said the rest; and the accounts spoke for themselves. That day they were asking the proprietors to sanction a step the Board were taking in introducing into Parliament a Bill for increased powers, and for enlarging the sphere of the Company's operations. The Bill would come before the proprietors at a special meeting; but, while he was speaking, there was a little explanation he should like to make in regard to it. To the remarkable extension and development that there had been at Bournemouth, some of their kind critics were about to tell them the success of the Company was due. Possibly something might be said on the other side, to the effect that supplying this popular health resort with an abundance of pure water had done something towards assisting in its success and development. Be that as it might, the supply of water had been one of their chief anxieties; and they were bound to look to the future, and see what was to be done to keep pace with the demand. Undoubtedly, their Wimborne supply was the best and the highest to which they could go, and all the best expert opinion they could obtain led them to say that Wimborne was the natural source, and should be the source, of their water supply. It was their duty to specially bear in mind the trend of legislation, which was leading to the use of the supplies Nature had given for larger districts rather than small areas. The Directors thought it well to "take Time by the forelock," and to obtain the advantage of the consolidation of their position and the controlling of the general supply of the whole district by approaching the Wimborne Water Company with regard to the amalgamation with the Bournemouth Company of their comparatively small undertaking. They entered into negotiations, and were at last successful in coming to terms. In the opinion of the Board, the terms were very liberal and generous to the Wimborne Company; but, on the whole, the advantage the Bournemouth Company had acquired justified them in the terms they had agreed with them. In negotiations of this sort, he always thought it better to spend money in making friends rather than throwing it away to no use in fighting and making enemies. Therefore they had come to terms with the Wimborne Company; and they believed the arrangements to be effected by the Bill would be of advantage not only to the Bournemouth Company but to the shareholders of the Wimborne undertaking; who would secure a good dividend in future; and if they came under their *ægis*, they would not only be assured of their dividends, but Wimborne consumers would get a better supply of water for the same price. Therefore, in regard to this part of the Bill, he could have no doubt whatever in commending it to the proprietors. Passing to the other end of their area, and referring to gas, they had the district of the Christchurch Gas Company. Christchurch and Bournemouth had been extending until now they almost, if not quite, met; and there was so much interweaving of the two districts that it seemed to the Board when they were going to Parliament to extend the water production at one end, it might be wise to consider the extension of the gas area at the other end. An approach was made between the Christchurch Company and themselves; and they all saw the obvious advantages of extending their field of operation. By-the-by, a large portion of Christchurch was fields at present; but so was part of Bournemouth itself at one time. However, in taking over Christchurch, they were extending their field of operation, and the Board thought they could secure that economy which a larger production and centralized control always gave to a gas company. With regard to the price of the Christchurch Company, this was a very different matter from that of Wimborne; and they could not deal with the Company quite in the same way. The interests of the two Companies were so interwoven, that the Directors thought the best principle to adopt was to call in independent persons from outside who could deal with the question from an expert point of view. It was therefore proposed that each Company should appoint a gas engineer to state a case, and an expert in gas accounts to deal with the figures from separate points of view. These four gentlemen would sit round a table, and try to come to a conclusion as to the right price to be paid. When they had got as far as they could in arranging a price, counsel would be appointed as arbitrator to settle the amount to be paid. The Bournemouth Company did not want to give a farthing less than the Christchurch undertaking was worth; and the Christchurch Company did not want to take a farthing more. If the five gentlemen appointed could not settle on a price, nothing could ever be done in the matter in Parliament or elsewhere. Turning to other subjects, the time had come when the size of the Board might be enlarged. In 1896—seventeen years since—provision was made in the Company's Act for, if the expansion to which they were looking forward took place, the Board to be enlarged, from the somewhat small number of four. The Board thought the time had come when—not merely owing to the developments presaged by the Bill, but owing to the actually existing state of affairs, the Board should be strengthened. Five was not too large a number for the present size of the undertaking. The Directors were going to ask the proprietors, in accordance with the 1896 Act, to authorize the appointment of five Directors in future, instead of four. They would also suggest that Mr. Charles L. Morgan—a well-known gentleman in the engineering world, of whom he (the Chairman) could speak in the highest possible terms, should be the fifth Director. Then he (the Chairman) did not hesitate to say that the proprietors would not wish an additional Director to decrease the amount of the remuneration of the Board; and so he understood that it would be proposed that there should be a small increase allotted to the Directors, to meet the fifth Director, and probably to give a little additional advantage to the other four who had borne the heat and burden of the day. There was one personal matter, if the proprietors would forgive him alluding to it. It was 25 years since he (the Chairman) became a member of the Board; and during the greater portion of the quarter

of a century he had been honoured by his colleagues by being elected to preside over the business of the Company. He had not at hand the figures showing the increase of business during this period; but it had been very extensive. The business had grown with increasing strength from year to year. He hoped the proprietors would dismiss from their minds that he attributed any of the success to his own efforts. He realized very fully—as fully as anybody could realize—the slender qualifications he possessed for his position. At all events, he had done his best; and he congratulated himself that, during the whole of this long period, he had been surrounded by such colleagues, and supported by such a staff as had enabled him to carry the Company to such a successful issue. He had Sir Corbet Woodall on one side, recently honoured by the King, and holding one of the highest, if not the highest, position in the gas profession. He had his friend Mr. Cash, who was rapidly rushing to the head of his profession as an accountant; and there was his friend Mr. Hesketh Jones, who had lived a long life in the gas industry, to the immense advantage of every undertaking with which he had been associated. Then there was the staff, headed by the Chief Engineer (Mr. Harold W. Woodall), who seemed to have inherited the ability for dealing with gas matters that his sire possessed. There was also Mr. Plumb, the head of one of the best staffs that any Company could require. These were the forces that had made the Company what it was, with at the same time all honour to the men who preceded them, and placed them in the satisfactory position, which it would ever be his (the Chairman's) utmost interest and honour to strengthen and maintain.

Mr. A. W. Oke thought the adoption of the report should be seconded on this occasion by an ordinary shareholder. He congratulated the Chairman on his successful administration over 25 years; and then he proceeded to congratulate the Board upon the excellence of the report and accounts, and to comment with appreciation on the salient features of the Chairman's speech.

The motion was unanimously carried.

Proposed by the Chairman, and seconded by Sir Corbet Woodall, dividends were declared on the preference shares at the rate of 6 per cent. per annum, 7 per cent. on the "B" ordinary shares, and 15 per cent. on the original shares, all less income-tax.

Moved by the Chairman, and seconded by Mr. R. Hesketh Jones, Sir Corbet Woodall was re-elected to his seat at the Board.

Mr. F. G. Barrett proposed, and Mr. R. H. Glen seconded, the re-appointment of the retiring Auditor (Mr. J. C. Benwell, F.C.A.).

This was agreed to.

The next resolution, proposed by the Chairman, and seconded by Mr. Pilley, authorized the appointment of a fifth Director; and succeeding this, on the proposition of the Chairman, seconded by Mr. William Cash, F.C.A., Mr. Charles L. Morgan was elected a Director of the Company. Mr. Morgan is also a Director of the Brighton and Hove Gas Company.

The motion was unanimously carried.

Moved by Mr. Arthur Woods, and seconded by Mr. Pilley, the fees of the Directors were increased from £1500 to £2000.

The Chairman, on behalf of his colleagues, thanked the proprietors for this substantial and practical way of supporting the Directors, and showing confidence in them.

On the proposition of the Chairman, seconded by Mr. William Cash, the Directors were authorized to raise additional capital by the issue of 5000 ordinary, or "B," shares of £10 each, and £20,000 of debenture stock, carrying interest at not exceeding 4 per cent. per annum.

The Company's Bill.

An Extraordinary Meeting was then held to consider, and if thought fit to approve of, the Bill promoted for the acquisition of the Christchurch Gas Company and of the Wimborne Minster Water Company, and for conferring further powers upon the Bournemouth Company. The Chairman having explained the two principal purposes of the Bill in his speech, it only remained for the Solicitor (Mr. S. E. Cash) to describe the objects of the Bill.

This having been done,

The Chairman moved a resolution approving of the Bill.

Sir Corbet Woodall said he seconded the motion with pleasure, because he believed the Bill, when transformed into an Act, would be to the advantage not simply of the Bournemouth Company, but of the consumers in their present area, as well as in the extended district. The advantages of amalgamation between Companies like those at Christchurch and Bournemouth were palpable. The gas would be manufactured at less cost by the amalgamated Company, so that they would be able to give advantage to the consumers in the Christchurch area, at the same time retaining a material advantage for their own Company and Bournemouth. The policy of enlarging their areas by Companies like their own was a wise and beneficial one all round.

The motion was unanimously adopted.

A resolution of a composite character was then proposed and carried, thanking the Chairman and Directors, the officers and their staffs, and the workmen for their loyal services.

BRISTOL GAS COMPANY.

The Annual General Meeting of this Company was held last Tuesday—Alderman J. W. S. Dix in the chair.

The Director-Secretary (Mr. John Phillips) having read the notice convening the meeting, the report of the Directors was presented. It showed that, after paying a dividend on the general capital stock and interest on the debenture stock, there would be a balance of £101,670 to be carried forward. The Directors recommended the payment of a dividend for the past half year at the rate of 5 per cent. per annum, subject to income-tax.

The Chairman, in moving the adoption of the report and accounts, briefly reviewed the year's trading—remarking that the figures spoke better than could the most eloquent of chairmen. The Directors were pleased to present such accounts, showing, as they did, the prosperity of the Company. They acknowledged with a great deal of pleasure their indebtedness to the Secretary and also to the Engineer (Mr. D. Irving) for the able way in which they had seconded the efforts of the Board. Indeed, all the Company's officials had pulled together so exceedingly well that the Directors felt it was due to the staff to mention it. So far as the concern went, it was prosperous in every respect; the popularity of gas, judged by its sale, showing no evidence of losing its hold upon the public. Comparing the year just ended with 1911, there was an increased sale of 54 million cubic feet; meters in use, 61,021, or an increase of 2443; and prepayment meters in use, 27,552, or an increase of 1937. There were 2742 more cookers on hire; the respective figures of 1911 and 1912 being 46,230 and 48,972. There was an extension of mains of 3½ miles; the total standing at 372 miles. The all-round increase under the chief headings was also maintained in the public lamp section, which now reached 9822—an increase of 82 on 1911. If he detained the shareholders an hour, he could not demonstrate more clearly the prosperity of the Company.

The Deputy-Chairman (Mr. Fenwick Richards) seconded the motion; and it was carried unanimously.

The retiring Directors and Auditor were re-elected; the dividend recommended was declared; and a hearty vote of thanks was accorded to the Chairman, Directors, and staff, for their sustained and excellent efforts put forward on behalf of the Company.

The Chairman and Secretary acknowledged the vote; the latter stating that he had been with the Company 53 years. The Board had honoured him by a nomination for a seat on the directorate; and the shareholders had unanimously confirmed the recommendation. As far as the officials were concerned, they would do their best in the time coming as they had done in the past for the Company.

A RECORD GAS YEAR AT SOUTH SHIELDS.

Presiding at the annual general meeting of the South Shields Gas Company last Thursday, Mr. James Readhead, in moving the adoption of the report and accounts, said the Company had had a most successful year. With regard to revenue, the income was £104,344, and the expenditure £80,141; leaving a balance of £24,203. The sale of 542½ million cubic feet of gas was an increase of 4·36 per cent.—22,725,147 cubic feet—and was the Company's largest annual sale. The gas-rental was £2532 higher; and the receipts from residuals increased to the extent of £5265; but coals alone had cost £4260 more, and the wages paid had advanced by £1527. After providing for interest and statutory dividends, and including £13,841 brought from the previous year, there was a balance of £17,053 to carry forward. The financial result of the year would be as gratifying to the shareholders as it had been to the Directors, particularly so in face of the industrial unrest which permeated the country during the period, including the national coal strike, railway men's strikes, and consequential increased costs of coal and all other materials and labour, including a general all-round advance to the workmen of the Company, which had been in operation throughout the year. The miners' strike in March was by far the most serious feature of the year. Owing, however, to the early preparations made by the Company in anticipation of a strike, they were able to maintain a full supply of gas. Having referred to the action of the chemical manufacturers on the residuals question, the Chairman, in conclusion, bestowed high praise on the Engineer and Manager (Mr. T. H. Duxbury), the Secretary (Mr. J. H. Penney), and their staffs, for their excellent services. He also testified to the loyalty and fairness of the workmen in all departments of the Company. Dividends were declared for the past six months which made, with the interim dividends, 8½ per cent. on the consolidated and new stock and 5¾ per cent. on the ordinary stock for the year.

IPSWICH GAS COMPANY.

The Annual General Meeting of this Company was held on Monday last week—Sir Daniel F. Goddard, J.P., M.P., in the chair.

The Secretary and Engineer (Mr. John T. Jolliffe) read the notice convening the meeting, and the Directors' report, with the accounts for the year ended Dec. 31, 1912, was presented. It was stated therein that there had been a satisfactory increase in the sale of gas, due to the general briskness of trade and the increased number of consumers; and the accounts showed a balance of £15,912 available for distribution, after payment of the interim dividend. The Directors recommended that further dividends should be paid at the full statutory rates (less income-tax); and then there would be a balance of £9529 to be carried forward.

The Chairman, in moving the adoption of the report, made an interesting speech. He alluded to the centenary of the Gaslight and Coke Company and to the formation of the British Commercial Gas Association, the objects of which he explained. He mentioned the annual meeting of the Association in Manchester last October, and quoted Professor Lewes to show the healthfulness of gas. Coming to the affairs of the Company, he said they began the year under the heavy cloud of the coal strike; but it ended a great deal brighter. The difficulties of the strike were over, their business had grown, and their working results had been exceedingly good. The output of gas during the year had augmented by nearly 5 per cent., compared with the previous year; and they had very nearly reached a consumption of 500 million cubic feet. In the revenue account, it would be noticed that they had received from private light rental £53,414, against £51,151 last year—an increase of £2263. This was a very excellent result to show; and he had taken the trouble to see what it really meant. He found that they were supposed to have in Ipswich about 17,000 dwelling-houses; and of this number 16,129 were supplied with gas. It was astonishing that in their large and growing town there were only 871 private houses which were not provided with gas. This was largely due to the increased use of the slot-meters, of which they

had 12,047. From these, they collected last year £29,882 in pennies, which meant over 7 millions; and they weighed something like 65 tons. The residual products had realized £22,296, against £20,779, or £1517 more. This was a very good figure, and represented 68½ per cent. of the cost of the coal. The Chairman then proceeded to deal with some comparisons of the Company's undertaking now and ten years ago which had appeared in a local paper, offered some remarks upon the Insurance Act, and concluded by directing the shareholders' attention to what the Company are doing in their fittings department.

The VICE-CHAIRMAN (Mr. W. Alexander) seconded the motion; and it was carried.

The dividends recommended were declared; the retiring Directors and Auditor were re-elected; and thanks were accorded to the Chairman, Secretary and Engineer, and other officials.

GAS SUPPLY AND PRICE AT WAKEFIELD.

Some Records.

At the 132nd ordinary general meeting of the Wakefield Gas Company on Monday last week, the Directors reported a balance for the past half year available for distribution of £8532; and they recommended the payment of the prescribed dividends—viz., £3 5s. per cent. (being £2 10s. per cent. and 15s. per cent. increment) on the ordinary stock, and £2 10s. per cent. on the 5 per cent. maximum stock, less income-tax—and the carrying forward of the balance. In moving the adoption of the report and accounts, Councillor G. A. Moorhouse, J.P., the Vice-Chairman, who presided in the absence of the Chairman (Dr. W. A. Statter, J.P.) through illness, drew attention to the fact that, owing to the heavy law and parliamentary expenses, amounting to £2049, due to promoting the Company's new Bill, they had not made sufficient profit during the half year by £423 to pay their usual dividends. They had now cleared off the whole cost of the Bill out of revenue. There had been an increase of 3·62 per cent. in the make of gas during the half year, and of 4·15 per cent. in the sale; while for the entire year the increases were 2·83 per cent. in the make and 3·80 per cent. in the sale. The leakage—6·88 per cent.—was the lowest on record; and considering that the Company's district was a colliery one, this was very satisfactory. It was quite a common occurrence for the roads to settle to such an extent as to shear-off the house services from the mains. This, of course, made it very difficult to keep the leakage down. The quantity of gas made and sold and the leakage were all records in the history of the Company. They had had to contend during the half year with a greatly increased charge for coals, which, however, was partly met by the improved return from residuals. After prolonged negotiations with the Corporation in regard to the prices to be charged under the new Act for gas for the street-lamps, markets, schools, &c., the Directors had made arrangements which were acceptable to both parties, and which left them on the best of terms. The dividends recommended were declared; and the usual votes of thanks were accorded to the Directors, the officers, and their respective staffs, and acknowledged by the Vice-Chairman, and by Mr. H. Townsend (Engineer and Manager) and Mr. R. B. Wilson (Secretary).

SCARBOROUGH GAS COMPANY.

The Annual General Meeting of this Company was held on the 15th inst.—Mr. W. S. ROWNTREE in the chair.

The MANAGER AND SECRETARY (Mr. Alexander Allan) having read the notice convening the meeting, the report of the Directors was presented. The accounts accompanying it showed a balance of £11,558 available for distribution; and the payment of the usual dividends (less income-tax) was recommended. There would be a balance of £4970 to be carried forward. The business continued to make satisfactory progress; the increase in the sale of gas being nearly 6 per cent. for the year.

The CHAIRMAN, in moving the adoption of the report, said the sale of gas to ordinary consumers had increased by upwards of 20 million cubic feet; but the gas supplied to the public lamps had fallen off by nearly 2 millions, owing to the Corporation continuing their scheme of conversion by substituting 3 or 4 cubic feet per hour burners for those consuming 5 cubic feet, thereby further reducing the efficiency of the public lighting. He might mention, however, that the increase in the sale of gas to private consumers last year was greater than the total quantity sold for the street lamps. Turning to finances, the total receipts were £55,133, compared with £52,428—an increase of £2705; and the total expenditure was £37,221, compared with £37,015, or £206 more. The balance carried to the profit and loss account was £17,912. He thought they could congratulate themselves that, while the price of nearly all commodities had considerably increased, it was otherwise with the price of gas in Scarborough. The low charge of 2s. 2d. net per 1000 cubic feet would continue, notwithstanding the extra cost to the Company of almost every article, from general stores to carbonizing materials. Throughout all the anxious period of the coal strike last year the supply of gas was maintained to the consumers and to the public lamps, thanks largely to the oil-gas plant. The relationship between the Directors, staff, and workmen, as well as between the Company and their customers, continued on a most friendly footing. It was gratifying to know that the consumers thoroughly appreciated the benefits of having their burners, lamps, fires, &c., attended to and kept in order free of cost.

The report was adopted; the dividends were declared; and a vote of thanks was accorded to the Chairman and Directors.

The CHAIRMAN replied, and proposed a similar vote to the works and office staff.

Mr. ALLAN, in acknowledging it, said they had had a trying year, owing to the coal strike; but the balance-sheet showed that they had come successfully through it. The vote of thanks was appreciated by the staff as well as by himself.

ILKESTON CORPORATION GAS UNDERTAKING.

Resignation of Mr. F. C. Humphrys.

[FROM OUR LOCAL CORRESPONDENT.]

Serious developments have followed upon recent revelations at Ilkeston regarding the manner in which money was applied for, and spent in connection with the Corporation gas undertaking. The Inspectors before whom evidence was taken in regard to the application to the Local Government Board for permission to borrow £50,000, of which the major portion was required for gas-works extensions, it may be remembered, did not hesitate to declare their belief that the Central Authority had been "hoodwinked" in relation to an investigation held in May, 1908, when a loan was asked for upon the understanding that a brick and puddle tank was to be provided for the new gasholder to be erected, whereas, though consent was given upon this distinct understanding, the plans were altered, and an above-ground steel tank, which proved to be ultimately the cause of the disaster, was substituted. It was impossible, after the request made by the Inspectors to the Mayor, that the matter could be further relegated to the limbo of things forgotten. But the sequel to the inquiry has not been of a character which, in the view of a large section of the ratepayers, is in accordance with equitable considerations. It is complained that Mr. F. C. Humphrys, who for the greater portion of his professional career has been the Manager of the undertaking, is being made the scapegoat for the Committee's laches—having been induced to resign his control, and accept the less responsible position of Engineer at a reduced salary. The resignation was tendered at a recent private meeting of the Council, sitting as a General Purposes Committee. But since the matter has become common knowledge in the borough, a good deal of indignation has found expression; it being contended in common, but expressive parlance, that it is a case of the Committee getting out upon Mr. Humphrys' back. It is felt by those who are best acquainted with the circumstances that it is upon the Committee who were responsible for the administration of the undertaking at the time the loan was negotiated that the real onus rests, and that Mr. Humphrys was merely in the position of one who had no alternative but to carry out the instructions given. Moreover, it is now publicly avowed that withholding from the Local Government Board Inspector in 1908 the revised plans was part of a pre-arranged scheme for which the Committee of the day should alone accept responsibility.

There was some plain speaking on the matter at a meeting in the town last Tuesday, at which Councillor J. Woolley presided. Mr. William Smith complained of the unfair treatment to which Mr. Humphrys had been subjected after thirty-five years' service. He urged that the Corporation were most unjustly trying to make one who had rendered excellent service to the town responsible for the change of plans in regard to the new holder. The speaker also went to the length of declaring that there was a gentleman resident in Ilkeston who was present when Mr. Humphrys was given instructions at the 1908 inquiry that he was not to let a word out about the changed plans; and, added the speaker, "to make him a scapegoat now is not good enough." Councillor T. N. Macdonald, who had been the principal speaker during the evening, observed, in reply to Mr. Smith, that, sorry and grieved as he was that this matter had had to come to pass, he himself made a suggestion, and he was glad it had been carried out, that Mr. Humphrys "should be fairly treated, with some *solatium* to him for the services he had rendered the Corporation for a number of years." The Local Government Board were, however, arbitrary masters; and Mr. Humphrys, recognizing that unless a certain course was pursued the ratepayers would be made to suffer very seriously for the error of judgment committed, "helped the Corporation by sending in his resignation." There was no question, said Mr. Macdonald, of Mr. Humphrys being "kicked out." Pressure had been brought to bear by a higher authority than the Ilkeston Corporation.

The whole business, it may be added, has left a very unpleasant impression in the town; and although the idea appears to be entertained in some quarters that Mr. Humphrys may be conveniently shelved, the fact remains that the Local Government Board have yet to say the last word in relation to some salient aspects of the matter.

Steps are being taken to convene an indignation meeting of ratepayers in regard to the treatment which has been meted out to Mr. Humphrys, who has occupied the position of Manager of the works since 1879; and it is understood that the gathering will be held in the course of the next few days. Meanwhile considerable sympathy is being expressed; it being urged that he has been forced into an ambiguous position, and that reasonable considerations demand that the remaining members of the former Gas Committee should themselves have resigned. Some regret also is evidenced that Mr. Humphrys, whose loyalty to the town's interests has been manifested upon all occasions, should have yielded to the pressure brought to bear. In keeping, however, with the policy which has led to this latest development in Ilkeston affairs, it is understood that no time is to be lost in filling up the vacant post of control; preliminaries in relation to advertising the vacancy being now under consideration.

THE GEYSER FATALITY AT PECKHAM.

Verdict of "Accidental Death"—The Dangers of Unventilated Bath-Rooms.

At Camberwell, last Thursday, Mr. G. P. WYATT held an inquiry respecting the deaths of three of the children of Mrs. Graham, at No. 32, South Grove, Peckham, as recorded in the "JOURNAL" last week (pp. 446, 480).

Mr. WASHINGTON watched the case for the South Metropolitan Gas Company; Mr. E. A. CLIFFORD appeared for Messrs. Ewart and Son, Limited, geyser manufacturers.

Albert Reginald Graham, the father, said the children had been in the habit of bathing themselves for the past eighteen months. The bath

water was heated by a "Shrewsbury" geyser, which had been in use about twelve months. It had no flue-pipe, and there was no method of ventilation in the room except by the window or door. He had previously had one of Ewart's "Victor" geysers in use for some four or five years; but it had become damaged, and he then bought a "Shrewsbury," which had been recommended to him as being better than the one he had. The "Victor" geyser, which was fixed against the front wall of the house, was fitted with a flue-pipe which passed out through the wall into the open air. Asked by the Coroner if he could account for the accident, witness replied that the printed instructions supplied with the geyser, which said that when the gas was alight the window or door of the bath-room must be left open, were not followed, as the window and the door were closed. In reply to a further question, witness explained the working of the geyser—saying it was lighted first and then the water was turned on. The bath-room was 8 ft. 5¾ in. by 5 ft. 4¾ in., and there was no fireplace in it. He had often told the children to be sure to keep the window open. On the day of the accident, they undressed in the bath-room, as their own was being cleared out.

Arthur Edward Andrew Graham, aged ten, said he usually bathed the children on Saturdays. He knew how to work the geyser, as he had done it on many previous occasions. He prepared the bath, and got in himself to see that it was not too hot. His little brother Harry would not enter the bath, and closed the door of the room. Almost directly afterwards, the three children in the bath felt queer. He got out of the bath and fell to the ground. The next he remembered was finding himself in bed with two of the other children. The other two were in another bed. In answer to the Coroner, witness said he did not open the window because it was so cold.

The mother of the children deposed to hearing a cry and going to the bath-room, where she saw two of them on the floor very ill, and the other three in the bath. She turned off the gas, opened the window, and endeavoured to restore the children.

P.C. *Johns* said he was called to the house; but when he arrived three of the children were dead. The last witness told him that her son Albert knew more about the working of the geyser than she did, and was in the habit of bathing the children.

Dr. *R. Govan*, who was called in, deposed that in each case death was due to suffocation from poisoning by carbonic acid gas.

Mr. *A. Stokes*, Chief Inspector to the South Metropolitan Gas Company, stated that he tested the geyser, and found that it consumed 90 feet of gas per hour, and the cubic capacity of the room was 354 feet. He closed the door and window of the room, and found he could not remain in there with the geyser more than four minutes. Of course, there should have been a ventilator in the room.

The CORONER: Quite so. Whatever may be said about these fancy geysers not requiring ventilators, it does not work out in practice, as this case shows.

The Jury returned a verdict of "Accidental death."

GAS PRICES IN MANCHESTER.

At a Special Meeting of the Manchester City Council last Wednesday, proposals of the Gas Committee for reduction of price came before the members on the motion of Mr. Kay, the Chairman of the Gas Committee. The Committee proposed that the price should be reduced by 1d. per 1000 cubic feet to ordinary consumers under 250,000 cubic feet; 2d. to ordinary consumers of 250,000 to 1,000,000 cubic feet; and 3d. to ordinary consumers of 1,000,000 cubic feet and upwards; 1d. per 1000 cubic feet for gas-engines of 1 to 2 million cubic feet consumption; 2d. for those of 2 millions and upwards; to allow a discount of 2d. per 1000 cubic feet for payment within one month; and to give prepayment consumers 4 and 5 cubic feet more per penny. It is estimated that the loss of income compared with the estimate for the current year will be £61,000. The Finance Committee, who have sanctioned the reductions, reported that they had had in view the expected contribution of £50,000 in relief of the city rates.

In response to remarks respecting the finances of the Gas Department, Mr. Kay said the reductions would lead to an increase in business, and the loss of income would not be so great as the sum mentioned. Some of the poorest ratepayers would benefit considerably by getting cheaper light and fuel; and the new discount system of collecting would lead to a saving, it was expected, of £7000 a year, and there would be no loss to the collectors employed.

The proposals were agreed to.

MR. JOHN BOND ON GAS MANUFACTURE.

A Radiant Efficiency Tester.

At a recent Meeting of the Southport Society of Natural Science, Mr. John Bond, the Corporation Gas Engineer, gave an interesting lecture on the manufacture of gas, illustrated by experiments and lantern slides.

Having explained the process of the manufacture, distribution, and testing of gas, the lecturer gave figures showing that the world's production of town gas during the past year amounted to 620,000 million cubic feet. To produce this quantity of gas, he said, something like 60 million tons of coal would be carbonized, and the coke made for sale would be 30 million tons, the tar products 3 million tons, and ammonia products equivalent to about 550,000 tons of sulphate of ammonia.

Referring to the Southport works, Mr. Bond said they were started in the year 1850, at a capital expenditure of £3500, and during that year about 500,000 cubic feet of gas were sold at the price of 7s. 6d. per 1000 cubic feet. At the present time, the Southport Corporation Gas Estate made upwards of 550 million cubic feet of gas per annum. The capital expenditure amounted to £300,000, and £120,000 had been repaid through the sinking fund. The capital now on mortgage stood at £189,000; and the average price of gas was 2s. 6d. The lecturer showed the operations of getting, screening, cleaning, and grading coal; and the system of gaseous firing on the regenerative system was explained on horizontal, inclined, and vertical retorts, and compared with the system first introduced by Murdoch.

After showing and explaining the plant used in the manufacture, purification, and distribution of gas, the lecturer illustrated the principle on which the apparatus he has invented for testing the radiant efficiency of gas has been constructed. One method he used for this purpose was somewhat on the lines of the bar photometer; but for the usual grease spot disc is substituted a specially constructed thermopile. One face of this, which is covered with a dead-black paint, is exposed to the radiant heat of a standard, which is raised to a known temperature, and emits a known quantity of radiant heat. The radiant heat from the fire falls on the other side of the thermopile, which is also painted dead-black. As one side of the thermopile represents the cold and the other side the hot junctions, a point on the scale can be found where the two sources of radiation give the same amount of heat. The gas used in the fire is of a known calorific value, and is carefully measured by means of a test meter, so that by applying the law of inverse squares, the percentage of radiant energy can readily be ascertained. The apparatus which Mr. Bond has designed for testing the hemispherical radiation of a fire is rather more complicated. The method of taking temperature measurements by various forms of pyrometers was explained.

A small installation of high-pressure gas was fixed in the building, to show the audience the quality and high illuminating value of the burners. Various forms of gas-heating appliances were shown, including gas-fires, radiators, and gas-cookers; and the lecturer remarked that he had many unsolicited testimonials with regard to their efficiency.

MR. ALEX. WILSON ON THE ADVANTAGES OF GAS.

Under the auspices of the Smoke Abatement League, Mr. Alex. Wilson, M.Inst.C.E., Engineer and General Manager of the Glasgow Corporation Gas Department, delivered last Tuesday a lecture, in the Hillhead Burgh Hall, on "The Advantages of Gas for Cooking and Heating." Bailie PAXTON, the Convener of the Gas Committee, presided over a large audience.

Mr. Wilson spoke of the efforts which are being put forth by manufacturers and others to bring about a clearer atmosphere over the city. It was being recognized in the industrial world that smoke sent out from chimney-tops meant waste; and progressive manufacturers were taking steps to carry on their heating, &c., with more economy and less danger and discomfort to the surrounding inhabitants.

A concise description of the treatment of coal in gas-works was given; and some very interesting lantern views, showing the improvements that have been made in plant and machinery since the days of Murdoch, were thrown on the screen. Mr. Wilson pointed out that, for heating furnaces, manufacturers are now beginning to realize that gas can be used to advantage for melting metals and hardening tools, &c.; and many engineering establishments in Glasgow have adopted gas-furnaces, which are giving highly satisfactory results, showing a greater saving in crucibles, &c.

The saving of labour and worry, and the economy secured, by using gas cooking appliances were fully demonstrated. Mr. Wilson instanced the difficulties and drawbacks to satisfactory heating from the coal-fire; and two very interesting diagrams, showing the variations in the radiation efficiency of coal-fires compared with the steady efficiency of gas-fires, were exhibited He mentioned that no gas-fire ought to cause the slightest odour in a room; and it was usually found, in cases where complaints were made about gas-fires giving off offensive smells, that the fault lay with the owner, who might use a fire for years and never think of having it overhauled.

The lecturer referred to the business done by the Gas Department since the inauguration of the systems of lending cooking appliances free of all charges, and of hiring gas-fires, to consumers. Upwards of 58,000 of the former appliances have been fitted since March 1, 1912; and about 12,000 gas-fires have been fixed since the 1st of June.

While the lecture was proceeding, two lady assistants from the showrooms of the department carried out a cookery demonstration on the platform; and at the close of the lecture much interest was taken in the various dishes prepared by them.

AYLESBURY ELECTRIC LIGHTING SCHEME.

The Aylesbury Urban District Council had before them at a recent special meeting the question of adopting an electric light and power scheme—a matter which has been referred to from time to time in the "JOURNAL." The Electric Lighting Committee stated that they had considered and approved of a report by a Sub-Committee upon a report made by Mr. Philip Dawson (of Messrs. Kincaid, Waller, Manville, and Dawson); and they recommended the Council to pass the following resolution: "That, in order to lay before the ratepayers an explanation and full particulars of the proposed electric light and power undertaking, a public meeting be held on a date to be fixed by the Chairman; and that the decision of the ratepayers be ascertained by a poll or referendum of the electors on the parochial register." The report was adopted. On the same occasion, the Finance Committee presented a special report on the financial aspect of the scheme. The following are some points from the three documents.

Mr. Dawson reported that the general character of the town of Aylesbury appeared to be favourable for the introduction of electricity; and, judging from experience elsewhere, he thought no difficulty need be anticipated in securing a sufficient number of consumers to render the undertaking a success. The site selected for the generating station was more than sufficient in size, and admirably situated, being

within a quarter of a mile of the Market Square, and upon the canal. He proposed the installation of Diesel engines to produce the necessary power. The system would be a three-wire direct-current one; 220 volts being available for lighting, and either 220 or 440 volts for power. Having given particulars of the equipment of the generating station and the distribution and public lighting plant, Mr. Dawson said that his estimate of the capital expenditure required was £16,253, *plus* £1625 for contingencies; making a total of £17,878. The estimated gross revenue, at a price of 3d. per unit and 6s. per annum meter-rent, was £1939; and the estimated working expenses (generation and distribution), at 1¾d. per unit, £686—showing a net revenue of £1253. In addition to this, there would be a saving of £287 in the cost of public lighting; making a total of £1540. Deducting the interest and sinking fund on the capital expenditure of £17,878, at 7 per cent. (£1250), there was left a surplus of £290. Mr. Dawson expressed the opinion that these results might safely be anticipated after the first year or two of working the undertaking; and that it might be safely taken for granted that in future years the revenue would show considerable expansion. With regard to his estimate of the working expenses, he thought it should be possible to supply and distribute energy at the figure he had given—viz., 1¾d. per unit sold—this price having been estimated on the basis of results obtained elsewhere where similar plant had been installed.

In the report of the Sub-Committee, they stated that they had had the assistance of Mr. R. J. J. Swan, the Engineer to the Chesham Electric Light and Power Company, in considering the details of Mr. Dawson's report; and he had expressed general approval of the scheme. He thought that the estimated working expenses should not exceed 1½d. per unit, and that the estimated surplus was a fair and reasonable one to be expected at the end of the second year.

The Finance Committee submitted the following statement in regard to the amount required for the scheme: Loan for buildings, &c., £11,875, for 25 years; loan for machinery, £6003, for 15 years—total, £17,878; annual charge for principal and interest, £1250. They said: "The cost of gas for street lighting for the current financial year was £523; leaving an estimated balance to come from the private lighting of £727, to which must be added the working expenses for private lighting only, estimated by Mr. Dawson at £491, or according to Mr. Swan's estimate of 1½d. per unit, £421; making a total of £1148, taking Mr. Swan's figures."

A resident at Aylesbury (Mr. W. C. Kirkby) has addressed to a local paper a letter on the above subject, at the close of which he puts a very pertinent question. He says: "It seems to me that those who are engineering the scheme want to exploit the ratepayers' money, and so burden the town with such a crushing weight of interest and debt repayment that cheap rates and rents will never come. Ratepayers, protect your interests as you would protect your pockets against those who would take all you have for themselves! If this is such a good thing, might I ask why the promoters of the scheme do not speculate with their own money instead of exploiting the ratepayers' money?"

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

Mr. Fulton, the Hon. Secretary of the Scottish Junior Gas Association (Western District), asked for a good muster of the members at the Dawsholm Gas-Works to view the vertical retorts which Mr. Alex. Wilson has designed and erected there on his continuous-intermittent principle. Mr. Fulton had his desire on Saturday, when probably the largest number of members were present together in the history of the Association; and they had something to see and to think about afterwards. There is no doubt that Mr. Wilson has reduced the machinery to the smallest point. We must have elevators to take the coal to the top of the retorts, and conveyors to take it over the various hoppers. The coke also must be removed from time to time; and for this purpose the small gauge locomotives which have been used for years in the Glasgow works have been employed. For the opening and closing of the lower doors, Mr. Wilson has used hydraulic power. The removal of the coke is entirely in the hands of the man in charge, as he allows as much or as little to fall out as he finds is fully carbonized; and if he thinks more time is required to take out all the gas, he draws only a smaller quantity. The coal breakers, elevators, and conveyors are in duplicate; but when the two rows of retorts are completed, each will be in use. In case of breakdowns, however, the one side can supply the two rows of retorts. This is where the large works score over the smaller ones, as the cost of the original installation is large enough when the single breaker, elevator, and conveyor is to be fixed; but if these have to be in duplicate, then the cost would be prohibitive. Mr. Wilson has had the conveyors fitted with ball bearings; and he finds that they only need oiling once a month, and also require much less power than those with plain bearings, which means a saving of gas in the gas-engine used. The retorts are always filled full up after the coke has been removed. The horizontal rotary valve is then turned, and the gas-making continues. Before the coke-doors are opened, a little steam is injected to drive the gas up the retort during the discharging period; and this steam becomes water gas, and passes away to the holders. The arrangement of permanent augers in each horizontal or arch pipe makes the clearing of these pipes a very easy matter, if it is ever required. One special arrangement, which is equally applicable to horizontal or inclines, is the placing of the main chimney dampers in an easily accessible place, so that they can be quickly and easily adjusted, and also the provision of a King's gauge, in a glass case, to show the amount of the draw of the chimneys. In this way the pull is kept constant, and consequently the openings for the primary and secondary air do not require to be altered nearly so frequently.

The Scottish Junior Gas Association (Eastern District) will visit the Cowdenbeath Gas-Works at 2.30 p.m. on Saturday next. After inspecting the works, they will visit the miners' rescue station, the mining school, and the burgh electric station. The Directors of the Cowdenbeath Gas Company, Limited, have kindly arranged to entertain the members at tea, in the Crown Hotel. The joint visit will be held at the Stirling Gas-Works, on March 22, instead of at Coatbridge.

Alloa.—The progress of the work included in Messrs. G. & R. Cousins' contract at the gas-works for the preparation for the installation of vertical retorts is being delayed by a strike on the part of thirty labourers, who demanded an increase of ½d. per hour. As this was refused, they have left the work.

Bridge of Allan.—A fairly large audience representative of the burgh assembled in the Museum Hall on Thursday evening, in connection with the proposal to acquire the local gas-works. Provost Turnbull presided; and he was fully supported by his colleagues. The Chairman referred to the undertaking, regarding which the entire Council were in complete unanimity about its acquisition. Councillor Innes followed, and quoted statistics from towns of similar size which had municipalized the gas; and these showed the enterprise to be a financial success. Councillor Robertson also spoke hopefully of the undertaking, and Bailie Brown concurred with what the previous speaker had said. Questions having been invited, it was asked what price the Council would be prepared to give for the works. The Provost refused to state a figure, deeming it unwise until expert advice had been obtained as to the market value of the concern. He stated that they had a figure agreed upon among themselves, beyond which they would not go.

Cambuslang.—The good folk of Cambuslang are referring to the new installation of Glover-West retorts (which are to be sixteen in number, and capable of making 5,000,000 cubic feet), as "a sky scraper," and, as usual, are talking of the amenity of the burgh. This, however, will not interfere with the completion of the work, which it is hoped will be finished and in operation in two months' time.

Coatbridge.—At the recent annual meeting of the Coatbridge Gas Company, the Directors presented to the shareholders a satisfactory report on the working of the Company in the past year. The total consumption of gas amounted to 212,464,764 cubic feet; being an increase of 26,008,014 cubic feet, equal to 13·95 per cent., over the previous year. The gas unaccounted for decreased from 8·76 to 6·91 per cent. There was an addition of 118 to the number of ordinary and prepayment consumers; and an increase of 1564 gas appliances hired out—affording further evidence of the growing popularity of gas for cooking, heating, and industrial purposes. The profit on the revenue account carried to the profit and loss account was £7333; and the balance on this account was £8445. The Directors recommended the payment of a dividend at the rate of 13 per cent. per annum on the original stock, and 9·1 per cent. per annum on the three issues of £10 shares, less income-tax.

Doune.—Having acquired the local gas-works on behalf of the community, the Town Council have not been long in seeing to the remodelling of the buildings. Plans are in the hands of tradesmen for altering, extending, and modernizing the premises and plant.

Dundee.—The gas-meter theft epidemic here continues. Three women were charged on Tuesday, and dismissed with an admonition by Sheriff Neish, for committing offences of this kind. Mr. W. F. Mackintosh, the Fiscal, in emphasizing the frequency with which these offences are committed, remarked that he had in hand eight cases from one tenement.

Edinburgh.—The Electric Lighting Committee have had a rule that the minimum charge for electric light to householders should be 15s. per annum, to other consumers 20s. per annum, and for power and heating 30s. per annum; and so as to be able to supply some of the consumers who at present use the prepayment gas-meter, they have unanimously decided to reduce the minimum charge for light to 10s. and for power to 20s. per annum, or where the supply is used for both purposes the combined charge of 30s. shall be the minimum. They have also agreed to extend their main in one of the eastern districts of the town.

Falkirk.—At the Town Council meeting, Councillor Gilchrist moved that a report on the condition of matters at the gas-works should be placed in the hands of the members of the Council. This was seconded by Councillor Snedden and supported by Treasurer Wallace, who said that they wished to discard the report of the Gas Manager, Mr. William Wilson, regarding the foundations, and to obtain one from a committee who had absolutely no knowledge of the gas-works at all. Mr. Muirhead, the Convener of the Gas-Works Committee, said that at the present time it would be premature to go into the report, and objected to Treasurer Wallace's remarks that the Committee knew nothing of the gas-works. Treasurer Wallace hastened to say he excluded the Convener from this remark. It was finally agreed by seven votes to six not to print the Gas Manager's report meantime. Treasurer Wallace and Councillor Gilchrist then resigned from the Sub-Committee, and the Provost and Bailie Russell were appointed in their place.

Galashiels.—Galashiels is discussing the installation of a municipal electric power station at a probable cost of £30,000, and Provost Sutherland, Bailie Dalgleish, and the Town Clerk are to visit Glasgow and report to the Council. It is said that lighting is not part of the scheme.

Hamilton.—The result of the action between Messrs. Alex. Russell and Co., coal contractors, of Glasgow, and the Corporation of Hamilton [*ante*, p. 470] will be watched with interest by gas managers. It seems a contract for delivery of 10,000 tons of cannel over a period of eighteen months was made, and that at the expiry of this period 2000 tons had not been delivered, though the contractors had been repeatedly requested to make deliveries. The preliminary discussion before the Sheriff-Substitute was as to relevancy, and Sheriff Hay Shennan has given his dictum almost entirely in the Corporation's favour, in that he considers they are entitled to set off the counterclaim for non-delivery and the purchase of more expensive coals against the sums due for coal delivered; but as regards the question of delivery after the contract period expired, he considers that they can make no claim.

Inverkeithing.—The annual general meeting of the shareholders of the Inverkeithing Gaslight Company, Limited, was held on Monday—Mr. Plant, the Chairman, presiding. In moving the adoption of the report, the Chairman pointed out that, owing to the increased demands for gas supplies, it had been found necessary to double the capacity of

the gasholder during the year, and to considerably extend the mains. Further extensions were being considered, to meet the cost of which additional capital would be required. He intimated that, as the prospects for the coming year were favourable, the Directors had decided to make a further reduction in the price of gas to consumers. The usual dividend was declared.

Kirkcaldy.—At a meeting of the Finance Committee of the Town Council on Wednesday, the expenditure in connection with the proposed extension of the gas-works was considered, and, after the figures had been carefully examined, it was agreed to arrange for financing the scheme.

Leith.—A violent explosion, which blew out the door of the house leading to the common stair and smashing several of the windows of houses in the vicinity, occurred in an unoccupied house in a tenement building, where several workmen were preparing to repair the gas-fittings. One of the workmen was slightly burnt about the neck.

Wishaw.—A special meeting of the Town Council—Provost Nimmo presiding—was held on Tuesday evening to consider (1) the statement made by Bailie Steel at the last monthly meeting opposing the resolution of the Council to erect a new gasholder, and (2) a statement by the Gas Manager in answer thereto. The Manager contended that extra storage was necessary. A long discussion ensued, in the course of which an undertaking was given that if the offers received in connection with the proposed gasholder exceeded the estimated cost (about £8000), the Council would be free to reconsider the question.

Mr. James M'Leod, of Greenock, writes pointing out that there is a slight error in the paragraph referring to Greenock in the "Notes from Scotland" in the last issue of the "JOURNAL," and asks us to insert the following excerpt from the minutes of the Greenock Corporation: "After careful consideration of a report by the Engineer and Manager, it was unanimously agreed to recommend that he should be authorized to issue specifications and take offers for a new gasholder; but before coming to any decision in regard to the portion of the report dealing with retorts, a deputation of five be appointed to visit a number of gas-works and to report."

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Feb.* 22.

Sulphate of Ammonia.

There is no new feature to comment upon in either the tone or the value of this material, the market having remained of a somewhat desultory nature during the past week. No new development has taken place in the demand from consumers; but the requirements for fulfilling previous contracts have proved large enough to prevent a further set-back, and the closing values still are £14 2s. 6d. per ton f.o.b. Hull, £14 3s. 9d. per ton f.o.b. Liverpool, and £14 6s. 3d. per ton f.o.b. Leith. Although producers are willing to contract up to December next at spot quotations, there is not much inclination to buy at these prices, and no first-hand transactions have been reported in the forward position.

Nitrate of Soda.

The market for this article is steady at 12s. per cwt. for ordinary quality, and 12s. 1½d. for refined, on spot.

LONDON, *Feb.* 24.

Tar Products.

The markets for tar products have remained fairly steady during the past week. Pitch maintains its price; and there is a slight increase in the figure. The inquiry continues good for both prompt and forward delivery; and in many quarters improved prices have been paid. Benzols are quiet, and there is little business doing. Solvent naphtha is also quiet; and there appears to be more of this article offering. Heavy naphtha is fairly steady; but new contracts are difficult to arrange. Creosote maintains its price. The inquiry is fairly good for near and forward delivery. Contracts are very difficult to arrange in crude carbolic. Consumers are still unwilling to pay the prices that are being asked by the distillers on this side.

The average values during the week were: Tar, 31s. to 35s. Pitch, London, 50s. to 50s. 6d.; east coast, 49s. 6d. to 50s.; west coast, Clyde, 48s. 6d. to 49s.; Manchester, 47s. to 47s. 6d.; Liverpool, 48s. to 48s. 6d. Benzol, 90 per cent., naked, London, 10½d. to 11d.; North, 10d.; 50-90 per cent., naked, London, 10½d.; North, 10d. Toluol, naked, London, 10½d. to 11d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 5⅝d. to 5¾d.; North, 5d. to 5⅛d. Solvent naphtha, naked, London, 1s. 1d. to 1s. 1½d.; North, 1s. 1d. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 3⅛d. to 3⅜d.; North, 3⅛d. to 3¼d. Heavy oils, in bulk, 3⅛d. to 3⅜d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 11d. to 1s. 11½d. Naphthalene, £5 to £9; salts, 50s. to 55s., bags included. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This market is quiet, and contracts are reported at slightly lower prices. Outside London makes are quoted at £13 8s. 9d.; Leith, £14 6s. 3d.; Liverpool, £14 3s. 9d. to £14 5s.; Hull, £14 3s. 9d.; Middlesbrough, £14 3s. 9d.

Strange Fatality at Handsworth.—"Death through misadventure" was the verdict of a Coroner's Jury who inquired into the death of a domestic servant at Handsworth. Deceased's mistress stated that on going to the woman's bedroom one morning, she found her lying on the floor with the room full of gas. She tried artificial respiration without success. A hole was discovered in the gas-pipe; and the evidence seemed to show that deceased had knocked a nail into the wall for the purpose of hanging up a looking glass.

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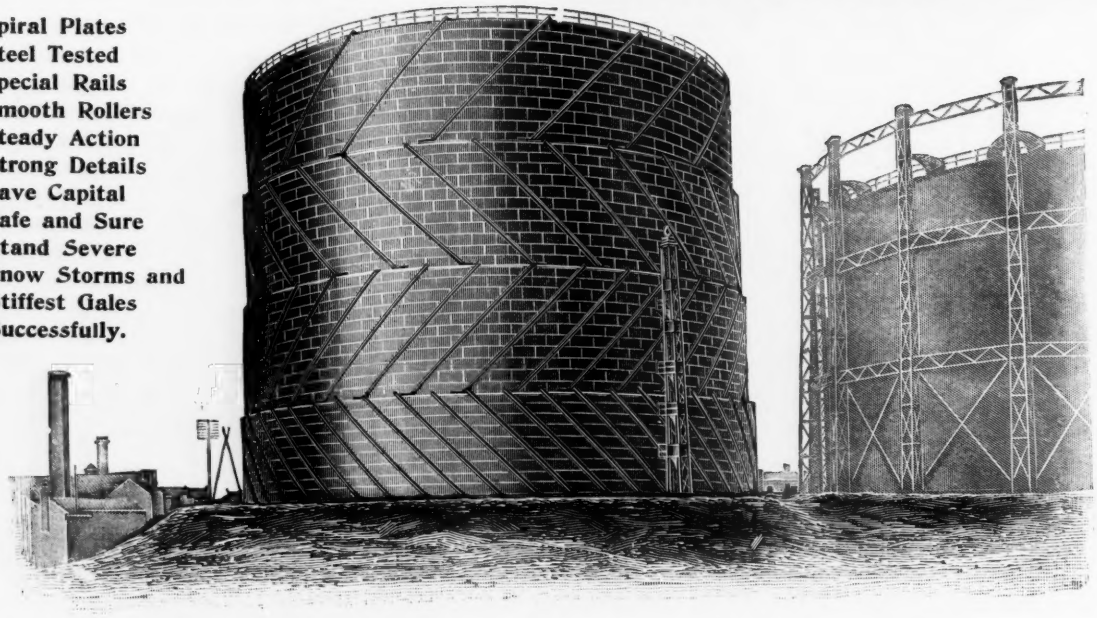


From a Photograph showing the conversion of a Two-Lift Guide Framed Holder to a Four-Lift Spiral Holder of 3½ million cubic feet capacity, for the Newcastle and Gateshead Gas Company, to Plans and Specifications of W. D. GIBB, Esq., M.Inst.C.E., Engineer.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a little ease in the prices of coal. The trade is, however, fairly good for the season; and the shipments are about an average. Steam coals are rather quiet; this being a dull period usually for this class of fuel. Best Northumbrian steams are from about 14s. 6d. to 14s. 10d. per ton f.o.b.; second-class steams are 14s., and steam smalls are rather plentiful at 10s. 3d. The collieries are working well, and the production is taken up fairly. In the gas coal trade, the home demand is now rather less; but exports are fair, though forward purchases are only cautiously entered into. Best Durham gas coals are from 14s. 3d. to 14s. 6d. per ton f.o.b. Second qualities are about 13s. 7d. per ton; and for Wear specials, about 15s. f.o.b. is quoted. One or two small contracts have been concluded. There is one of 8000 tons for Esbjerg at 19s. 9d. per ton, delivered there, and another for Viele at 20s. 6d. per ton delivered; while a larger quantity—some 80,000 tons—for Konigsberg, over the year, is believed to be at about 18s. 3d. for good Durham gas coals. These prices seem to show slight falls from recent quotations, if current freights be counted. One or two other contracts are in course of negotiation; and a full export of gas coals is expected when the shipping season is entered upon. Coke is rather quiet. Gas coke may now be quoted at about 17s. 9d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

There is continued buoyancy throughout the Scotch coal trade, and prices rule firm. The demand is equal to the output; and there is no appearance of any decline in values. The following were the prices on the Glasgow Coal Exchange on Friday: Steam coal, 13s. 6d. to 14s. 6d.; splint, 15s. to 15s. 6d.; ell, 13s. 9d. to 14s. 6d.; trebles, 14s. to 14s. 6d.; doubles, 13s. 9d. to 14s. 3d.; and singles, 13s. 6d. to 14s. f.o.b. Glasgow.

Bridgnorth Gas Committee and their Coal Contractors.—At a recent meeting of the Bridgnorth Town Council, the quarterly report presented by the Gas Committee contained the following paragraph in reference to a difficulty which had arisen between the Committee and some of their coal contractors: "Prior to the coal strike, one of your Committee's coal contractors failed to deliver the full quantity of a certain class of coal, in accordance with the contract; consequently your Committee made a claim for breach of contract. This was resisted, and your Committee felt justified in making it the subject of a set-off in the final settlement with the contractors. After the lapse of about six months, the contractors commenced an action in the High Court to recover the amount of their final account—viz., £137 18s. 3d. The proceedings, having progressed up to a certain point, were afterwards withdrawn by the contractors, and a sum of £120 was accepted in full settlement of the claim, and they paid their own costs."

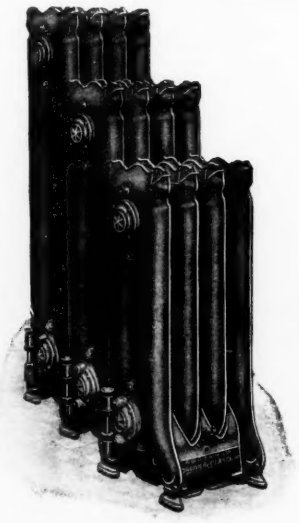
Final Meeting of the Swinton Gas Company.

The undertaking of the Swinton and Mexborough Gas Company having been acquired in 1911 by the local District Councils, the final meeting of shareholders was held last Thursday. Mr. J. A. Bower, who presided, submitted the report, and said the sum awarded by the Arbitrator (Mr. A. J. Ram, K.C.) was £60,370, which, together with £2246, the cost of the Company's Act of 1908, made the total sale price of the undertaking £62,616. Included in the revenue account was £268 for stocks and stores. The balance of book debts had been disposed of for a satisfactory sum; and the amount divisible among the shareholders was £45,175, of which £40,800 had been paid to them. In accordance with the resolution of the Company passed in November, 1911, the balance of £4375 was divisible at the rate of £1 2s. 5½d. per share. He proposed that the report be adopted, and that the Company confirm the payments already paid to the shareholders, and approve of the disposal of the balance as stated. This was carried unanimously. The shareholders expressed themselves as perfectly satisfied; and with the close of the meeting there passed out of existence a Company which was originally formed in 1866, and was reconstructed by Act of Parliament in 1908.

Coke-Stack on Fire at Birmingham.—Last Tuesday evening, smoke was noticed coming from a stack of 7000 or 8000 tons of coke at the Windsor Street Gas-Works of the Birmingham Corporation. The outbreak was due to the presence of pieces of half-carbonized coal smouldering inside. The Fire Brigade were summoned, and, with the aid of a steamer, they directed their efforts to confining the fire to one section of the heap, while the surrounding coke was being removed. There was no danger to life or property in the neighbourhood.

Barnstaple Gas Company.—A very satisfactory report was presented to the shareholders of the Barnstaple Gas Company at the annual meeting on the 15th inst. Mr. C. E. R. Chanter, the Chairman, stated that the quantity of gas sold showed an increase of 1,650,000 cubic feet, while there had been a decrease in the quantity of coal carbonized; the figures being 4604 tons last year, compared with 4847 tons in 1911. The total revenue for the year was £10,874, against £10,631 before. The total expenditure was £8610, compared with £8457. The profit for the year was £2236, against £2173. As the profit was more than sufficient to pay the dividends of 10 and 7 per cent. on the two classes of shares, the Directors had decided to reduce the price of gas by 2d. per 1000 cubic feet. The statement as to the working showed that 4604 tons of coal were used; and the total quantity of gas made 48,260,700 cubic feet, of which 43,918,200 cubic feet were sold. The unaccounted-for gas had been reduced to 7 per cent. Mr. Chanter concluded with a tribute to the Manager and Secretary (Mr. F. L. Schofield) and the rest of the staff. He said Mr. Schofield had had a year of great anxiety, but had come out of it exceedingly well. The report and balance-sheet were adopted, and the dividends recommended declared.

By Test the Best.



THE "Main" Gas-heated Steam Radiators give the best heating results.

They are made on the soundest mechanical lines with metal to metal joints (no rubber or red lead used).

They are absolutely safe. Each Radiator is capable of standing a pressure of six times the maximum that can be obtained in actual use.

And last, but not least, they are fitted with our patent, automatic regulating valve—the most efficient and positive device of its kind. It reduces the gas consumption immediately the temperature rises. Ensures economy and prevents the waste of gas, which is inevitable with a valveless radiator.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N.; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.
SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, GLASGOW; 56, Broad Street, BIRMINGHAM; 83, Old Market Street, BRISTOL; 13, Whitworth Street West, MANCHESTER; 8, Exchange Place, Donegall Street, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

Nottingham Corporation and District Consumers.

Not content with their demand for a reduction in the price charged for gas, some representatives of the outside districts which obtain their supply from the Nottingham Corporation have gone to the length of suggesting a claim to participation in the profits of the undertaking. Seeing that they do not run any risk as to liability for the great amount of capital involved in the enterprise, the suggestion might almost be regarded as chimerical had not its authors gone to the extent of endeavouring to enlist the co-operation in the matter of one of the chief local authorities. The Basford Rural District Council have the main administrative control in the areas beyond Nottingham supplied from the Corporation mains; and to this authority the Eastwood Council applied at a meeting last week to ascertain whether there would be willingness to join in the expense of taking the opinion of counsel as to the proper construction of the Nottingham Corporation Gas Act, and the claim that the places outside the city had to a share of the profits. The Basford Council were not slow, however, to recognize the entirely untenable nature of the proposition, though expressing their willingness to join in any application to the Corporation for a reduction of price. On the latter point, recent utterances do not afford any ground for encouragement. The Corporation view of the matter is that outside districts are already very fairly treated. The Chairman of the Gas Committee has not hesitated to declare that he would charge a higher rate than that at present imposed—an aspect of the matter not without significance, in view of the fact that while the district consumers are in no way liable for capital expenditure, the risk to Corporation plant in the territory beyond the municipal area is yearly becoming more serious by reason of the subsidences through colliery workings with which the ground is in all directions becoming honeycombed.

Bridlington and Gas-Works Purchase.—Acting on the Council's instructions, the Town Clerk of Bridlington wrote to the Secretary of the Bridlington Gas Company, asking at what price the Company would be prepared to sell their undertaking to the Corporation as a going concern. The reply made is to the effect that the Company have no intention of disposing of their undertaking.

Truro Water Company.—It was reported at the annual meeting of this Company that the work of covering the old reservoirs had been undertaken under the supervision of the Manager, and was being satisfactorily carried out. The Chairman (Mr. A. C. P. Willyams) stated that the analyses of the water continued to give most satisfactory results; and the Company were now supplying water as good as any in England. The accounts showed that there was a balance in hand of £2582; and it was decided to pay a dividend of 5 per cent. and a bonus of 5s. per share—leaving £1782 to be carried forward to the next accounts. It was stated that the total amount paid in bonus is now £2 15s. per share.

An Inquiry at Wombwell.—A proposal to use certain land recently acquired for the purpose of erecting a new gasholder, was the subject of a Local Government Board inquiry at Wombwell, at which opposition was offered by the tenant and the owner of a house 66 yards away from the site. The tenant admitted that the existing holders were only 110 yards away from the house, but said they did not occupy a prominent position in front of his window. The Inspector (Mr. R. C. Maxwell) suggested that, as a railway ran in front of the house, the erection of a gasholder could not do much more to depreciate its value. The tenant, however, replied that he liked looking at trains, as they were "alive and interesting;" and the Clerk to the Council (Mr. P. M. Walker) said the site of the gasholder could be moved two or three yards, if this would meet the opposition.

GAS COMPANIES' STOCK AND SHARE LIST.

There was no improvement last week in the state of affairs on the Stock Exchange; and markets suffered from depression. All factors were hostile to improvement—the Balkan situation, trouble in America, anticipation of renewed labour difficulties at home, and the tightness of money being prominent among them. Only towards the close was a ray of hopefulness discernible regarding the near East. Prices have thus receded in nearly every line. The opening on Monday was much depressed, chiefly on account of the political outlook; and all markets were weaker. Gilt-edged gave way generally; but Consols were unchanged. Railways were very dull and low. American prices were down; and Foreign were sensitive. Tuesday was heavy and gloomy; and—though the depression somewhat moderated in the course of the day—prices closed at a fall pretty nearly all round. Consols dropped ⅛ for money and account; and Rails were very dull on fears of unrest among the operatives. On Wednesday, most markets breathed more freely—war alarms being less keen. Prices, however, made little if any recovery. Government issues were irregular, Rails went up and down again, Americans continued weak, and Foreign were dull. Thursday opened as if determined to see a bright side to things, but achieved only moderate success. Government issues looked up, and Consols rose ¼; but rails were reserved and suspicious. Foreign went fairly well for a while, but weakened later. Friday had a similar opening, but gave way afterwards, and everything became dull and moping on the usual selling. Consols contrived to hold on; but the other chief markets were weaker generally. On Saturday, business was very quiet. There was no strongly marked characteristic, except that Rails were rendered uneasy by manifestations of labour unrest. Consols closed at 74⅛ to 74¼—showing no change from the opening price of the week. The Money Market was rather irregular; being mostly stringent, but with a somewhat easier turn at times. Business in the Gas Market was more abundant than the week before—but that was only a low standard of activity—and dealings were better distributed throughout the list. The market was not strong—the general depression which prevailed in other departments having seemingly invaded the habitually calm domain of gas Gaslight and Coke was unable to resist the influence; and the ordinary stock receded from an opening mark of 103½ until 101⅛ was reached towards the close—a fall of 2. In the secured issues, the maximum and the preference lost ⅛ each; the former changing hands at 81⅛, and the latter at 96½ to 97⅜. The debenture realized from 76 to 77⅛. South Metropolitan was quiet, and marked from 112½ to 113¾—a fall of 1. The debenture was done at 75. No transactions were marked in Commercials. Among the Suburban and Provincial group, Alliance and Dublin was done at 76⅛ and 78, Bournemouth "B" at 15 15/16 and 15⅞, British at 45½ and 45⅞ (a rise of ½), Brighton original at 213, ditto ordinary at 153½, South Suburban at 120, and Tottenham "B" at 114 and 114⅜. In the Continental companies, Imperial realized from 172 to 175 (a fall of 1), ditto debenture from 86 to 87, and Union 85½ and 86. Among the undertakings of the remoter world, Monte Video was done at 12 15/16, Melbourne at 99½ and 100¾, Primitiva at 6⅜ to 6⅞ (a rise of ⅛), ditto preference at 5⅛, San Paulo debenture at 50¾, and South African at 10⅜—a rise of ½.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 11	5	Alliance & Dublin Ord.	75—80	..	6 5 0
374,000	,,	Jan. 16	4	Do. 4 p.c. Deb.	83—86	..	4 13 0
280,000	5	Oct. 11	7½	Bombay, Ltd.	6½—7	..	5 7 2
50,000	10	Aug. 29	15	Bourne-mouth Gas and Water { 10 p.c. B 7 p.c. Pref. 6 p.c.	29—30	..	5 0 0
332,000	10	,,	7		15⅝—16½	..	4 6 2
75,000	10	,,	6		14—14½	..	4 2 9
880,000	Stk.	Aug. 14	14†	Brentford Consolidated	265—270	..	5 3 8
880,000	,,	,,	11†	Do. New	205—210	..	5 4 9
50,000	,,	,,	5	Do. 5 p.c. Pref.	115—117	..	4 5 6
206,250	,,	Dec. 12	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
217,380	Stk.	Aug. 29	11	Brighton & Hove Orig.	210—215	..	5 2 4
244,200	,,	,,	8	Do. A Ord. Stk.	152—155	..	5 3 3
530,000	20	Sept. 27	12½	British	45—46	+½	5 8 8
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	99—91	..	4 7 11
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	92—94	..	4 5 1
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	3½—4½	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	71—75	..	6 0 0
157,150	Stk.	Feb. 13	5	Chester 5 p.c. Ord.	107½-109½*	..	4 11 4
1,513,280	Stk.	Aug. 29	5/9/4	Commercial 4 p.c. Pref.	106—108	..	5 1 2
560,000	,,	,,	5½	Do. 3½ p.c. do.	102—104	..	5 2 6
475,000	,,	Dec. 12	3	Do. 3 p.c. Deb. Stk.	71—73	..	4 2 2
800,000	Stk.	,,	4	Continental Union, Ltd.	84—87	..	4 12 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	130—132	..	5 6 1
492,270	Stk.	—	5¾	Derby Con. Stk.	124—125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
1,002,180	10	Jan. 16	10	European, Ltd.	18½—19½	..	5 2 7
16,415,840	Stk.	Feb. 13	4/17/4	Gas-light and Coke { 4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref.	101—103*	−2	4 14 7
2,600,000	,,	,,	3½		80—83*	−½	4 4 4
4,062,235	,,	,,	4		96½—98½*	−½	4 1 3
4,674,850	,,	Dec. 12	3	Coke { 3 p.c. Con. Deb.	75½—77½	..	3 17 5
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	91—93	..	5 7 6
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	16—16½	..	6 13 4
131,000	Stk.	Sept. 13	7⅞	Ilford A and C	154—157	..	4 17 1
65,780	,,	,,	6⅛	Do. B	122—124	..	4 18 9
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	89—91	..	4 7 11
4,940,000	Stk.	Nov. 14	9	Imperial Continental	172—177	−1	5 1 8
1,235,000	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.	85—87*	..	4 0 6
200,242	Stk.	Aug. 29	6	Lea Bridge Ord. 5 p.c.	122—125	..	4 16 0
561,000	Stk.	Aug. 29	10	Liverpool United A	223—225	..	4 8 11
718,100	,,	,,	7	Do. B	160—162	−1	4 6 5
306,083	,,	Dec. 30	4	Do. Deb. Stk.	98—100	..	4 0 0
63,480	Stk.	Jan. 16	3	Maidstone 3 p.c. Deb.	68—70	..	4 5 9
75,000	5	Nov. 28	6	Malta & Mediterranean	4¼—4½	..	6 6 4
250,000	100	Oct. 1	4½	Met. of Melbourne { 4½ p.c. Deb.	99—101	..	4 9 1
541,920	20	Oct. 30	3⅛	Monte Video, Ltd.	12½—13	..	5 7 8
1,775,892	Stk.	July 26	4½†	Newc'tle&G'tesh'd Con.	102½—103½	..	4 7 0
529,705	Stk.	Dec. 30	3⅜	Do. 3½ p.c. Deb.	86—87	..	4 0 6
55,940	10	Aug. 29	7/7/0	North Middlesex 7 p.c.	13¾—14½	..	5 1 5
300,000	Stk.	Nov. 28	8	Oriental, Ltd.	125—130	..	6 3 1
60,000	5	Sept. 27	10	Ottoman, Ltd.	8⅛—8⅜	..	5 14 3
60,000	50	Aug. 14	13	Portsea, Island B	127—130	..	5 0 0
100,000	50	,,	12	Do. C	124—127	..	4 14 6
249,980	5	Oct. 11	8	Primitiva Ord.	6½—7	+⅛	5 14 4
499,960	5	Dec. 30	5	,, 5 p.c. Pref.	5—5⅛	..	4 15 3
521,600	100	Dec. 2	4	,, 4 p.c. Deb.	96—98	..	4 1 8
346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	92—94	..	4 5 1
275,000	5	Apl. 12	12	San Paulo, Ltd.	13—14	..	4 5 9
150,000	10	Sept. 27	6	Do. 6 p.c. Pref.	11½—12	..	5 0 0
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Aug. 29	10	Sheffield A	234—236	..	4 4 9
209,984	,,	,,	10	Do. B	230—232	−3	4 6 2
523,500	,,	,,	10	Do. C	230—232	−1	4 6 2
90,000	10	Sept. 27	7½	South African	10—11	+½	6 16 4
6,429,895	Stk.	Feb. 13	5/9/4	South Met., 4 p.c. Ord.	112½-114½*	−1	4 15 5
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	74—77	..	3 17 11
209,820	Stk.	Aug. 14	8½	South Shields Con. Stk.	164—166	..	5 2 5
952,795	Stk.	Aug. 14	6†	S'th Suburb'n Ord. 5 p.c.	119—122	..	4 18 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	117—119	..	4 4 0
117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.	118—120	..	4 3 4
594,740	Stk.	Nov. 14	5	Southampton Ord.	102—105	..	4 15 3
120,000	Stk.	Feb. 13	7½	Tottenham and { A 5 p.c. B 3½ p.c.	139—142*	..	5 2 1
483,940	,,	,,	5¾		113—115*	..	5 0 0
149,470	,,	Dec. 30	4	Edmonton { 4 p.c. Deb.	92—94	..	4 5 1
182,380	10	,,	5	Tuscan, Ltd.	6½—7½	−1	6 13 4
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	115—115½	..	4 6 7
255,636	Stk.	Aug. 29	6⅝	Wands-worth { B 3½ p.c. 3 p.c. Deb. Stk.	140—143	..	4 16 2
85,766	,,	Dec. 30	3		63—70	..	4 5 9

Prices Marked * are "Ex. Div." † Next dividend will be at this rate.

Uxbridge Gas Company.—At the recent meeting of this Company, the accounts presented for the past year showed a sum of £8414 available for distribution; and the Directors recommended the payment of a dividend, less income-tax, at the rate of 6½ per cent. on the consolidated stock, which would absorb £7951, and leave £463 to be carried forward. Allowing for the interim dividend at the rate of 3 per cent. paid in September, there would be a balance of £3 2s. 6d. to be paid. The Chairman (Mr. H. E. Jones), in moving the adoption of the accounts, commented upon their satisfactory nature, as well as that of the dividends; the latter having been well covered by the earnings. The accounts were adopted; and the Directors were authorized to raise £11,556 by the issue of preference or consolidated stock.

Public Lighting of Bedford.—The Bedford Town Council, at their quarterly meeting, approved of a recommendation of the Electricity and Street Lighting Committee to extend the public electric lighting at a capital cost of £1151. Mr. Miller, during the discussion, pointed out that the Gas Company had offered to put up 160-candle power incandescent lights on the same terms as were fixed for the old flat-flame burners; and there would be no capital outlay for the Corporation. The electric lights proposed were to be of 25-candle power; and it seemed to him a ridiculous waste of money. Mr. Sowter said the matter had been thoroughly considered; and the difficulty was that the Gas Company wanted a term of years. At present they were paying £198 a year to a private Company; whereas if the streets in question were lighted by electricity, they would be paying £170 a year to themselves. He, however, added the significant remark that, if the gas had been a municipal concern, they would have had no hesitation in adopting the incandescent light.

Water Charges at Saltash.—Instructions were given to the Town Clerk at the last meeting of the Saltash Town Council to give notice to all consumers of water to terminate the agreements under which they are now supplied, and to substitute for them charges on the basis of a water-rate. Alderman Rawlings explained that since 1893, when the Council first undertook the supply of water, they had charged on the rental system. It was suggested in 1907 that they should make a water-rate; but it was decided to adhere to the old system. No complaint was made by anyone until, in March, 1911, it was proposed to increase the rents from 1s. to 1s. 2d. in the £ on the gross rent of the property. Mr. A. Geake then resisted the charge, and the result of proceedings in the County Court and of an appeal to the Divisional Court was that the system of water-rentals, which imposed the charge on the gross value, was declared illegal, and that in future the Council would have to raise the money by means of a rate which would be made on the net value. They would also have to pay the costs of the action. [See *ante*, p. 332.] The former charge of 1s. 2d. on the gross rental would be raised to about 1s. 6d. in the pound on the net value. Some consumers would pay a little more and some a little less; but the general effect would be very slight. Mr. Geake, who had raised the point, would have to pay 1s. 8d. a year more than before.

Messrs. Ed. Bennis and Co., Limited, of Little Hulton, Bolton, have received orders from the Cardiff Gas Company, for their Grangetown works, for eight "Bennis" stokers and self-cleaning compressed-air furnaces and a "Bennis" plant for handling and storing coke breeze.

We have received from Messrs. Poultons and Timmis, Limited, of 20 and 23, Holborn, E.C., a coloured diagram which they have just issued, showing various designs of regenerative retort-settings. The firm will be pleased to forward a copy, upon application, to any of our readers who may be interested in it.

Shortage of coal has, it is reported, for some time past been causing trouble to the Bradford Corporation Gas Department; and though there has recently been a slight improvement in deliveries, 2500 tons of coal had to be taken from stock in a fortnight. It is stated, incidentally, that the demand for coke has considerably fallen off.

An announcement appears in the local Press to the effect that the Merthyr Electric Traction and Lighting Company desire to express sincere regret to the consumers with regard to an "irregularity" in the lighting supply on a recent Saturday evening. It appears that there was, for a period of two hours, an "intermittent supply," the cause of which was unknown.

The Leek Urban District Council have adopted a report of the Gas Engineer, in which he stated that, in order to increase and maintain the gas supply to the west-end of the town, it would be advisable to lay a new trunk main from the works to a specified spot. Application is to be made to the Local Government Board to sanction the borrowing of £2000 for the purpose of carrying out this and other necessary main extensions in the near future.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Works Superintendent. Cheltenham Gas Company. Applications by March 6.
Manager. Forres Gaslight Company. Applications by March 8.
Outdoor Superintendent. Stretford Gas Company. Applications by Feb. 27.
Draughtsman. C. & W. Walker, Donnington.
Draughtsmen. Box 540, G.P.O., Manchester.
Works Foreman. Stretford Gas Company. Applications by Feb. 27.
Junior Chemists. Birmingham Gas Department Applications by March 11.
Water Rental Clerk. Rhymney and Aber Valleys Gas and Water Company, Caerphilly.
Storekeeper and Timekeeper. No. 5700.
Main and Service Layer. Rugby Gas Company.

Appointments, &c., Wanted.

Inspector. No. 5698.
Engineer or Representative. Gas, c/o W. Porteous and Co., Glasgow.
Research Chemist. M.O.C., c/o Street's, Cornhill.

Plant, &c. (Second-Hand), For Sale.

Crossley's Gas Engine. Education Offices, Oldham.
Retorts and Fittings, Condensers, &c. Sutton Gas Company.

Patent, Licences, &c.

Gasholder, &c. W. P. Thompson and Co., 6, Lord Street, Liverpool.
Mantle Manufacture. Haseltine, Lake, and Co., 7 and 8, Southampton Buildings, W.C.
Self Intensifying Gas Lamp. No. 5696.

Stocks and Shares.

Barnet Gas and Water Company. London Mart. March 11.
Brentford Gas Company. London Mart. March 11.
Brighton and Hove Gas Company. London Mart. March 4.
Dartford Gas Company. London Mart. March 4.
Harrow and Stanmore Gas Company. London Mart. March 4.
Lowestoft Water and Gas Company. London Mart. March 4.
Sevenoaks Gas Company. London Mart. March 11.
Tendring Hundred Water Company. London Mart. March 4.

TENDERS FOR

Coal.

Brighouse Corporation. Tenders by March 6.

Fire-Clay Goods.

Brighouse Corporation. Tenders by March 6.
Rhondda Gas and Water Department. Tenders by March 5.

General Stores—(Sulphuric Acid, Lime, Brass and Gun Metal Fittings, Oils and Paints, Pitch, Ironmongery, &c., Shovels, Forks, Tools, &c., Iron and Steel, &c., &c.

Brighouse Corporation. Tenders by March 6.
Darlington Corporation. Tenders by March 13.
Hebden Bridge and Mytholmroyd Gas Board. Tenders by March 10.
Ramsgate Gas Department. Tenders by March 10.
Rhondda Gas and Water Department. Tenders by March 5.

Meters and Meter Fittings.

Brighouse Corporation. Tenders by March 6.
Darlington Corporation. Tenders by March 13.
Rhondda Gas and Water Department. Tenders by March 5.

Oxide.

Broadstairs Gas Company. Tenders by March 3.

Pipes, &c., and Pipe Laying.

Brighouse Corporation. Tenders by March 6.
Darlington Corporation. Tenders by March 13.
Hebden Bridge and Mytholmroyd Gas Board. Tenders by March 10.
Leek Gas Department.
Rhondda Gas and Water Department. Tenders by March 5.

Tar.

Exeter Gaslight Company. Tenders by March 7.
Hebden Bridge and Mytholmroyd Gas Board. Tenders by March 10.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
Palmerston House,
Old Broad Street, London, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
Andrew Stephenson, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

AMMONIACAL Liquor Wanted.
Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.
Telegrams: "Chemicals."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, Oldham, and 45 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
Repairs receive prompt attention.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"Braddock, Oldham," and "Metrique, London."

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.

GENERAL MANAGERS—
London and South of England:
W. T. P. CUNNINGHAM,
13, Arcadian Gardens, Wood Green, LONDON, N.
North of England, Midlands, and Wales:
J. BROWN & CO., LTD., Savile Town, DEWSBURY.
Scotland and Ireland:
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

OXIDE OF IRON.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
"KLEENOFF," THE COOKER CLEANER.
BALE & CHURCH, LTD.
5, Crooked Lane, London, E.C.

TAR WANTED.
THOMAS HORROCKS & SONS, LTD.,
Albert Chemical Works,
Grant Street, Miles Platting, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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